

IVBCH Dept.

# FULL COURT FRENZY™

## OWNERS AND SERVICE MANUAL

COPYRIGHT 1992 INNOVATIVE CONCEPTS IN ENTERTAINMENT INC.

LICENSED FROM C.L. TECHNOLOGY

716-~~873-0111~~

739-0360

# TABLE OF CONTENTS

INTRODUCTION. . . . . *	.....*	PAGE 3
. Game Features		
. Game Play		
ASSEMBLY .....	* .....	PAGE 5
. Set-up		
. Customizing Your Game		
. Message Center		
. Self Test		
. Credit Cost Display		
. Game Testing		
. Electronic Game Counter		
MAINTENANCE & TROUBLE SHOOTING .....		PAGE 11
. Quick Trouble shooting		
. Operational Background		
. Mechanical Repair		
. Maintenance		
. Electronic & Electrical Repair		
OPTIONAL ACCESSORIES. . . *	.....* .....	PAGE 21
. Ticket Dispenser		
. Card Dispenser		
. Dollar Bill Validator		
LISTINGS .....		....PAGE 23
SCHEMATICS. . . . . *	.....*	PAGE 25
MONITOR SERVICE MANUAL .....		PAGE 41
DIAGRAMS & ILLUSTRATIONS.....		.....PAGE 65
WARRANTY INFORMATION.....		.....PAGE 69

# INTRODUCTION

## GAME FEATURES

**FULL COURT FRENZY™ (F.C.F.)** is a revolutionary concept in Coin Operated basketball games. You will see that this game includes many features which make it the obvious choice for your location.

**FULL COURT PLAY.** F.C.F. incorporates a basket that rotates from side to side and moves back and forth. Depending on which game has been chosen, the basket will move to various DIFFERENT positions as the game progresses. This movement adds many shooting angles to challenge the player. The mechanism that operates this unique capability is very reliable and simple in design. Cut steel gears make the drive mechanism almost immune to wear, and a built in high tech multi-plate clutch absorbs any stresses that can be generated by even the most deliberate abuse.

**A 19" COLOR MONITOR** is used to display all scoring and statistical information, and gives the game a look no other basketball can claim. A colorful attract mode rounds out the look of the monitor, and informative game play directions are just 3 push button away for the game players.

**MESSAGE CENTRAL.** A scrolling message display option is incorporated to allow the location or operator to advertise or display messages on the display monitor. These messages are displayed along the bottom of the screen during the attract mode. They are easily programmed through the push buttons on the control panel.

**SUPER TAMPER PROTECTION.** F.C.F. has exceptional tamper circuitry integrated to the main P.C. Board. If the game is over, and someone attempts to open the ball gate, an alarm will sound for five seconds. If someone scores a basket when the game is not in play the basket will turn around, to prevent further attempts at game play. If any further baskets are made due to intentional vandalism, the game will then sound an alarm. This feature can not be defeated by game players, as the game is

supported by a heavy duty rechargeable battery with a built in recharging circuit. As an operator you can of course turn this option off, by disabling the alarm through programming options.

**HEAVY DUTY CONSTRUCTION** is incorporated throughout the game by using only heavy gage metals and plastics. The game can be assembled and disassembled many times without any harm to the game. You will appreciate this feature if you move your games often.

**A CUSTOM OVER UNDER CASH DOOR** is used in this game. It is the only basketball game available that has a stacking dollar bill validator / over under door combination. This adds a great deal of security to the game while keeping maintenance simple. An optional custom security hasp system is available for the front panel on this game. "MATE-LOCK" connectors are used throughout the game for their rugged reliability as well as making it virtually impossible to connect haphazardly the wrong way. Heavy duty optical sensors are used throughout. Digital sound effects are used for optimum dependability. Over twenty sound effects are incorporated into the sound effect circuits. The game electronics have been highly integrated into the Main P.C. Board assembly, making it easy to repair games. The game has a full feature self test system to make trouble shooting easier.

**OPTIONS -** A ticket dispenser or card dispenser and a dollar bill validator, can be ordered with your game.

## GAME PLAY

Full Court Frenzy™ is an electromechanical coin operated amusement game designed to be played by one to four players.

There are three different games that can be played on the game....

# INTRODUCTION

QUICK SHOT is the last word when it comes to exciting 'Full Court' basketball action. In this exciting game, the basket and backboard move to different positions every three seconds. This means the player gets the feeling of shooting the ball from all over the basketball court. But you'll better shoot quick, 'cause that basket could move any second. In fact the ability for the basket to move to all these different positions is so unique, it's covered by United States Patents!

RUN - N - SHOOT is as exciting as QUICK SHOT with one big difference! The basket does not move until you make the shot. This creates a totally different feel to the game player.

HOT SHOT is a game similar to the traditional basketball games already on the market. However, we have made this an even more exciting game. The net remains stationary as the player shoots over and over. Two points are awarded for each basket scored. When 10 seconds remain in the game, the hoop moves back into 'Three Point Range', and awards the player 3 points for all baskets scored.

In addition, all games feature a unique statistical information screen at the end of the game. Our optical sensing system allows us to monitor how many shots have been taken, and display the shooting percentages when the games end.

# ASSEMBLY

## BEFORE YOU BEGIN

WARNING: WHEN INSTALLING THIS GAME, A THREE PRONG GROUNDED A.C. RECEPTACLE MUST BE USED. FAILURE TO DO THIS COULD RESULT IN SERIOUS INJURY TO YOURSELF OR OTHERS. FAILURE TO USE A GROUNDED RECEPTACLE COULD ALSO CAUSE IMPROPER GAME OPERATION, OR DAMAGE THE ELECTRONICS.

DO NOT DEFEAT THE GROUND PRONG ON THE POWER CORD FOR THE SAME REASONS AS GIVEN ABOVE. USING AN IMPROPERLY GROUNDED OUTLET COULD VOID YOUR WARRANTY.

THIS GAME USES A HIGH VOLTAGE COLOR MONITOR. OBSERVE NECESSARY PRECAUTIONS WHEN SERVICING THIS COMPONENT. SAFETY PROCEDURES FOR THIS CAN BE FOUND IN THE SERVICE SECTION OF THIS MANUAL UNDER MONITOR SERVICE & REPAIR.

TOOLS NEEDED: Before you start, you will want the following items:

- 7/16" Combination Wrench
- 7/16" Deep Well Socket
- Ratchet
- Side Cutters
- Adjustable Pliers

If you plan on moving your game often, or would like to speed up assembly, a cordless Ratchet is a good idea.

Your game requires a MINIMUM CEILING HEIGHT of 102" (8 1/2 feet). Check clearance before proceeding.

## SET-UP

1. To begin assembling your game, remove it from the shipping containers. The game can be removed by removing the 6 bolts and washers near the bottom of the boxes. Your ratchet with 7/16" deep well socket will work well for this. Lift the boxes straight up and off. Remove any protective packaging from around the components.

The game is bolted to the bottoms of the containers, and the bolts must be removed at this time. Using A 7/16" deep well socket and Ratchet, remove the bolts holding the framework to the container bottom. There are four bolts located on the flat metal plates on the bottom of the frame. Remove the bolts, and slide the frame off of the container bottom. Open the access door (large door) on the game cabinet. You will see two bolts with large washers located on the cabinet bottom. Remove these bolts, and carefully slide the cabinet off of the container bottom.

2. The framework of the game should be opened

and set up at this time. Refer to the drawings at the rear of this manual to see how the framework should look when it is set up correctly. It is a good idea to install all hardware closely, until all hardware is installed. This makes aligning of the bolt holes easier.

3. Untie the ropes that hold the front and rear frames together.

4. Slide the two frames apart until the bolt holes at the bottom front of the rear frame, and the bottom rear of the front frame line up. The front frame can be identified by the hinged panel attached to it. Slide a 2-1/2" bolt with washer through the two frames at (A), and secure with a washer and nylock nut.

5. Slide retaining pins into locations (B) to prevent the tubes from sliding into the larger tubes when the upper frame is fully extended. If these are not used the optical sensors may not work correctly.

6. With some help, raise the upper frame sections as far as possible for your ceiling height. Install 1-3/4" bolts with washers at locations (C). Secure with a washer and nylock nut. Be sure that you count the holes on the upper pipes on both sides to be sure that the frame is being installed evenly.

7. Install 2-1/2" bolts with washers at location (D). You must line up the holes of the two frames as well as those of the upper frame. Secure with nylock nuts.

8. Install the ball return mounting brackets. They are long square steel tubes with five holes in each of them.

9. Remove the 2 nuts at the bottom of the turntable guide rails at the middle of the game. (E)

10. Install the mounting brackets onto the bolts and re-attach the washers and nylock nuts.

11. Attach the front ends of the brackets to the framework with 1/4-20 x 2 1/2" bolts, washers, and nylock nuts. (F)

12. Swing the hinged ball return panels up until they meet the mounting brackets. Secure the panels to the brackets to the panels with the 2 1/2" bolts and large fender washers supplied. Attach the hardware from the inside out, so that any excess bolt length will be facing away from the center of the game. Secure with washers and nylock nuts.

13. At this time you will install the Basket Assembly. Push the Frame's netting up and out of the way to make room for the Assembly.

14. Install the backboard post into the turntable assembly. Be sure to feed the wiring harness for the

# ASSEMBLY

basket sensor up through this post line up the hole in the turntable assembly to the hole in the backboard tube. **ALIGN THE BACKBOARD** and secure with 2, 1/4 - 20 x 2 1/2" bolts, 4 flat washers, and 2 nylock nuts.

15. Install the backboard to the backboard post.

16. Adjust the height to maintain approximately 1 ft between the top of the backboard, and the top of the frame. When using the lower height settings, this clearance will have to be lowered to approximately 6" to maintain clearance between the hoop net, and the turntable. Try to maintain a height that allows the best angle for shooting the ball. Secure the backboard with one 1/4 - 20 x 2 1/2" bolt, 2 flat washers, and a nylock nut

17. Connect the connectors from the backboard tube harness to the sensor wiring connectors. Push any excess wiring into the backboard tube and secure with a tie wrap as shown in the illustration.

**IMPORTANT: LEAVE ENOUGH SLACK IN THE SENSOR WIRING TO ALLOW THE SENSOR RING TO SWING FREELY ON THE NETTING. FAILURE TO DO THIS COULD RESULT IN PREMATURE FAILURE OF THE SENSORS DUE TO WIRE DAMAGE.**

18. You will now attach the cabinet to the framework of the game.

19. Move the framework of the game into its final position on location.

20. Move the cabinet to the front of the frame, and line up the four mounting holes in the frame to the mounting holes in the cabinet. Start four 1/4-20 X 1 3/4" bolts with washers into the cabinet (G) Leave the bolts loose at this time as you will have to install the side covers of the game into this area later.

21. You will now connect the harness from the turntable to the Main P.C. Board.

22. Open the access door on the front left hand side of the cabinet.

23. Feed the harness from the turntable through the 2" hole located on the back of the cabinet.

24. Connect the harness to the Main P.C. Board. The mating connector- is located at the lower rear of the P.C. Board. It can only be installed one way.

25. You will now install the Ball sensor harness to the connector in the cabinet. The ball sensor harness hangs down from the optical RECEIVER unit located on the upper front of the framework.

26. Feed this harness through the 1" opening on the upper rear of the cabinet. Through the arge

access opening in the back of the cabinet, you will see a mating connector for the receiver harness, Connect the two together.

27. You will now attach the frame netting to the framework of the game. A section of nylon rope is used for this process This is used rather than tie wraps, as the rope can be used over and over again, which is important if you move your game often, it also allows for easier adjustment, should it be needed later.

28. Starting at the rear of the game, pull the netting down securely and lace the netting to the framework. This is accomplished by winding the rope around the framework and catching every third opening in the netting, (see diagram).

29. Start at the rear of the game, and work forwards. When in the REAR of the game, put the rope through the bottom mesh (opening).

30. When you start working on the rear SIDE, put the rope through the second row of openings in the mesh.

31. When you get half way forwards, where the pipe gets higher, start lacing through the third row of openings in the mesh.

NOTE: Lace about three feet at a time then go back and pull the lacing tight one wrapping of the rope at a time. It is important to pull the netting tight.

32. When you have all the netting fastened, tie the rope at the front of the framework.

33. Using the supplied black tie wraps, fasten the cable for the ball sensor to the tube that runs down the left hand side of the upper frame. Attach it so that the cable runs down the back of the tube, where it is not noticed when playing.

34. You will now install the fabric side panels. Unfold the side panels and install the supplied plastic tubing into the front seam of the side panels. This will retain the panels to the front of the frame.

35. Push the panels between the cabinet and frame, so that the tubing goes inside the framework. (See illustration at the rear of the manual).

36. Tighten the cabinet to the frame, so the panels are pinched between the cabinet and framework.

37. Using the black tie wraps, securely fasten the rear edges of the panels to the framework

38. Using the black tie wraps, securely fasten the upper edges of the panels to the frame NETTING.

39. Push the lower edges of the side panels firmly to the framework to engage the velcro strips that retain the bottoms of the panels.

# ASSEMBLY

40. Install the rebound guard. This is a clear plastic panel with bent flanges. Attach the guard to the upper front frame. (That's the frame with the optical receiver mounted to it.) Install where the lowest visible adjusting holes are located. Install with tie bent flanges facing inward. Insert the 1 1/2" bolts and washers from the outside. Secure with washers and nylock nuts.

The coin mechanisms have individual inputs for each mech. Enter the "game Options" mode to adjust this setting. The coin 1 input controls how many coins it takes to receive 1 credit. The number for the coin 2 input is the TOTAL of the coin 1 input. Example: If coin 1 was set for 2 coins per credit, a "1" being set on coin 2 would equal 2 coins. If coin 1 was set for 4 coins per credit, a "1" being set on coin 2 would equal 4 coins.

## CUSTOMIZING YOUR GAME

This section will discuss areas such as setting up credits, time per game, awards, etc. The tab below will show how to enter into the game programming mode and how to adjust many of the game's operating parameters.

### ENTERING SET-UP MODE

You must enter set-up mode to adjust all of the game features. This can be accomplished in the following manner..

1. Open the game access door. This is the door located on the left hand side of the game.
2. Locate the set-up button on the main P.C. Board. It is located at the bottom left hand portion of the board. An illustration on the "programming" decal on the inside of the access door can help you locate the button.
3. Press the set-up button.
4. Programming modes can now be accessed by pushing the basketball buttons on the face panel next to the monitor.

### CHANGING GAME SETTINGS

The numbers for each option can be changed by using the various buttons on the face panel.

1. Push the "option" button until the arrow is by the setting you wish to change.
2. Press the "up" or "down" button to change that setting.
3. Press the "exit" button when finished.

## COIN MECHANISMS

### FREE PLAY

You can set your game up for free play by adjusting the coins per credit for coin 1 to "0"

### CREDITS PER BILL

This option controls how many credits you will receive for each bill inserted.

### CURRENT CREDITS

This displays the credits currently in the game. You can manually remove or add credits to the game by changing the value of this number.

### TIME PER CREDIT

This adjusts, in seconds, how long each game will last. The game can be adjusted from 20 to 45 seconds. The recommended time for all games is 40 seconds.

### GAME 1 POINTS PER AWARD

This adjusts how many tickets or cards are given away for the "Quick Shot" game. The number displayed is how many points must be scored for EACH ticket or card awarded. Setting this number to "0" will turn off the dispenser.

### GAME 2 POINTS PER AWARD

This adjusts how many tickets or cards are given away for the "Run - n - Shoot" game. The number displayed is how many points must be scored for EACH ticket or card awarded. Setting this number to "0" will turn off the dispenser.

# ASSEMBLY

## GAME 3 POINTS PER AWARD

This adjusts how many tickets or cards are given away for the "Hot Shot" game. The number displayed is how many points must be scored for EACH ticket or card awarded. Setting this number to "0" will turn off the dispenser.

## JUST FOR PLAYING

This feature is valuable in 2 respects.....

1. This can be set to any value desired, so that if a player, especially a young child can not get the minimum points required to earn awards through the above settings, awards can still be dispensed.
2. This setting can give a predetermined amount of tickets or cards per game, REGARDLESS of points scored, if the "points per award" and "winner" settings are set to "0".

## WINNER AWARDS

This setting is used by itself if you want the WINNER ONLY to get awards in a multiple player game. The number of awards dispensed is determined by the number selected. A setting of "0" will turn off this option. The winner awards are in addition to any other awards being dispensed.

## ALARM MODE

This feature is a great deterrent to tampering. The alarm will sound under the following conditions:

1. If the ball gate is forced open when a game is not in progress, or wedged open by bottles, cue sticks, etc.
2. If the game is over, or turned off, and 4 or more balls are thrown through the hoop, the game will consider this a tamper condition. This prevents players from continuing to play, even if they cut the game mesh and remove the balls in an attempt to play for free.
3. If the game is powered down during a game. (Someone trying to keep the ball gate open). The ball gate will also automatically close at this time.
4. If the ball gate is open when the game is powered up. (This indicates a problem with the ball

gate.)  
A setting of "1" enables the alarm. A setting of "0" turns the alarm mode off.

## ATTRACT INTERVAL

This determines the length of time between attract modes. Change this number to change the amount of time in MINUTES between attract modes. Setting this number to "0" turns this option off.

## MESSAGE CENTER

The MESSAGE CENTER is a feature that can help you or your location by displaying important information that you want your customers to read, such as daily specials, special events, etc. It can be programmed as follows.....

1. Enter the "Scrolling Message" option.
2. Push the "Left" or "Right" button to go forwards or backwards through the letters, numbers, and characters that are available.
3. Push the "Next" button to enter that character into game memory, and advance to the next space.
4. Push the "Exit" button when done.

HINTS: You can not go back a single letter if you make a mistake. You must push the "Next" button until you scroll around to the beginning of the message. A faster way to get back to the beginning of the message, is to exit, and reenter the option.

You can clear the message in one of two ways. First, either enter a new message over the old one, or enter all blank spaces, to erase the old message. Second, you can remove battery power to the Main P.C. Board and shut game power off. This will remove the entire message at once. However, if you do this, any accounting information or custom set-ups you have in game memory will be erased, and must be reentered.

## SELF TEST

A self test option is included with the game programming to assist in game manufacturing at the factory. This option is however very useful for diagnosing problems which may arise in the field.



# ASSEMBLY

1. Enter this option through the options menu screen by pressing the set-up button on the Main P.C. Board.

2. Once In the test mode you can do the following:

- a) Push the face panel push buttons to check for their proper operation. An audible sound will be heard if working properly.
- b) The face panel push buttons should light in turn if they are working correctly.
- c) Move the coin mech. mkm switch wim. An audible sound will be heard if they are working correctly.
- d) Pass your hand through the ball in play sensor. An audible sound will be heard if working properly.
- e) Shoot a ball into the basket. If the sensor is working correctly, an audible sound will be heard.
- f) Notice that there are 2 sets of numbers that appear on the monitor. If the encoder sensors are working properly, one of the sets of numbers will scroll up or down when the basket moves.

To exit the self test mode, press the "set-up" button on the Main P.C. Board.

## CREDIT COST DISPLAY

The credit cost screen is displayed at the end of the instruction screen. This is used to display how much each game costs to play in easy to understand language. After deciding how much each game should cost to play, set the coins per credit, as described previously. After this has been done, enter the "Credit Cost Display" mode through the programming mode. Once in this mode, follow the directions on the screen to program the proper information onto the screen. This info must be entered manually, as it does NOT automatically change when coins per credit are set. This is to

allow extra flexibility when deciding on how YOU want to bill your customers about game cost

## GAME TESTING

It is easy and advisable to test your game after installation. After the game is set up and all options have been set up correctly, perform the following tests:

1. Test for proper acceptance of money.
2. Test for proper dispensing of cards or tickets, if you have set that option.
3. Test for proper game play, including proper scoring.
4. Test for proper retention of game memory, when the game power is shut off, and turned back on.
5. Be sure to check your electronic game counter, and write down any info you may wish to record from the permanent column on the left hand side. Press the "Clear" button on the face panel to reset all numbers in the resettable column on the right hand side.

## ELECTRONIC GAME COUNTER

Your game is provided with an innovative game counter. By simply pushing the counter button inside the coin mech door, or entering the accounting mode through the programming screen, you have access to accounting information that can earn you more money with your game. In addition to counting games played and awards given, you get information on how many single or multiple player games have been played. How many games of "Quick shot", "Run-n-Shoot", and "Hot Shot" that have been played is also displayed.

To exit the game counter, press the "Exit" button on the face panel.

# MAINTENANCE & TROUBLE SHOOTING

## QUICK TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	SOLUTION
NO SPOTLIGHT OR MONITOR	BAD FUSE AT POWER MODULE GAME UNPLUGGED	INSPECT MAIN FUSES CHECK POWER CORD
NO SPOTLIGHT	BAD LIGHT BULB BAD MAIN FUSE	REPLACE BULB INSPECT MAIN FUSES
NO MONITOR	BAD MAIN FUSE BAD FUSE ON MAIN P.C.B... BAD FUSE CN MONITOR P.C.B.	INSPECT & REPLACE FUSES AS NECESSARY
BALL GATE WILL NOT OPEN OR CLOSE	BAD MICRO SWITCH BROKEN WIRING TO SWITCHES BAD GEAR MOTOR	CHECK SWITCHES AND WIRES FOR CONTINUITY CHECK GEAR MOTOR FOR PROPER MOVEMENT ( perform self test )
PUSH BUTTONS DO NOT LIGHT OR WORK PROPERLY	BAD LIGHT BULBS BAD MICRO SWITCHES BAD WIRING	REPLACE LIGHT BULBS CHECK SWITCHES AND WIRING FOR CONTINUITY
BALLS DO NOT SCORE CORRECTLY	BAD OR IMPROPERLY ADJUSTED BALL SENSOR BAD WIRING	READ SERVICE PROCEDURES FOR REPLACEMENT OR REPAIR OF SENSOR CHECK WIRING FOR CONTINUITY ESPECIALLY THROUGH ROTARY MOTOR SHAFT
BASKET DOES NOT MOVE BACK AND FORTH CORRECTLY	BASKETBALL DUST ON RAILS BAD GEAR MOTOR BAD WIRING OF TURNABLE PLATFORM BAD OR DIRTY OPTICAL DECAL BAD OPTICAL SENSOR	CLEAN AND RE LUBRICATE RAILS CHECK OPTICAL SENSOR CHECK CONTINUITY OF WIRING TEST & REPLACE SENSOR
BASKET DOES NOT ROTATE FROM SIDE TO SIDE CORRECTLY	BAD GEAR MOTOR  BAD CLUTCH LOOSE CLUTCH SET SCREWS BAD WIRING DIRTY OR BINDING BALL BEARINGS BAD OPTICAL SENSOR BAD OR DIRTY OPTICAL DECAL	CHECK GEAR MOTOR (perform self test ) REPLACE CLUTCH TIGHTEN SCREWS USING LOCK-TITE CLEAN & RELUBE BEARING TEST & REPLACE SENSOR CLEAN OR REPLACE DECAL
GAME DOES NOT TAKE OR ADD MONEY CORRECTLY	IMPROPER OPTION SETTINGS  BAD MICRO SWITCH BAD WIRING  BAD DOLLAR BILL VALIDATOR	CHECK SERVICE MANUAL FOR PROPER GAME SETTINGS REPLACE MICRO SWITCH CHECK WIRING FOR CONTINUITY REPAIR BILL VALIDATOR

# MAINTENANCE & TROUBLE SHOOTING

PROBLEM	PROBABLE CAUSE	SOLUTION .
GAME DOES NOT DISPENSE TICKETS OR CARDS CORRECTLY	GAME <b>OPTIONS</b> SET IMPROPERLY BAD WIRING DIP <b>SWITCHES</b> SET IMPROPERLY ON DISPENSERS BAD DISPENSER	RESET GAME OPTIONS CHECK WIRING FOR CONTINUITY REFER TO DISPENSER SERVICE MANUALS & SET DISPENSERS TO EMULATE <b>DELTRONICS</b> <b>#1275</b> DISPENSER
NO OR LOW GAME: SOUND	BAD <b>SPEAKER</b> BAD WIRING BAD MAIN P.C. BOARD	C:HECKSPEAKER W/OHMETER CHECK WIRING FOR CONTINUITY TEST & REPLACE MAIN P.C.B.
PICTURE ON MONITOR DIM OR WASHED OUT	<b>IMPROPER</b> ADJUSTMENTS BAD <b>MONITOR</b>	REFER TO MANUAL FOR SPECIFIC ADJUSTMENT PROCEDURES REPLACE MONITOR
GAME DOES NOT DISPENSE BALLS QUICKLY ENOUGH	NOT ENOUGH BALLS IN GAME	GAME REQUIRES 7 BALLS

# MAINTENANCE & TROUBLE SHOOTING

## OPERATIONAL BACKGROUND

The following will outline the basic operating principals of the FULL COURT FRENZY™ basketball game.

The positioning system of the FULL COURT FRENZY™ basketball game is operated by gear motors that control both the linear and rotary action of the game, and an optical tracking system to control the actual positioning of the basket assembly.

The linear (back and forth) motor, is a 60 R.P.M. motor with heavy duty gearing incorporated into the gear box itself. The motor is a 6-24 volt D.C. motor, operated at 12 volts D.C. This gear motor is attached to the side of the chassis mechanism, and its output gear mates with a rack gear attached to one of the side rails. When the motor is activated, this moves the basket mechanism back and forth.

The rotary (side to side) gear motor is also a 6-24 volt D.C. motor, operated at 12 volts D.C. This motor operates at 15 R.P.M., as this motor is connected straight up through the chassis and into the turntable assembly. Since the gear motor turns slowly, and is connected directly, this could cause a high amount of stress from the constant changing of direction, as well as someone rotating the turntable by hand.

To counter the stress levels imposed on the rotary gear motor, we have incorporated a heavy duty, compact friction clutch assembly to counter ANY stresses or shocks the gear motor might incur. This clutch is rated to last over 20 million revolutions. Because of its design, the clutch actually gets stronger after this time. As the average game played will turn the clutch less than 1 revolution, it is easy to see why the clutch will last a long time.

The actual positioning of the turntable and chassis is controlled by 2 identical optical encoder P.C. Boards located on and in the chassis. These optical encoders look at decals, one of which is located on me of the guide rails, and the other, on the bottom of the turntable. These decals have a series of bars, or black and reflective silver stripes on them. When the gear motors move the basket mechanism back and forth, the sensors see the bars go by them. As the bars go by, they reflect light to the sensors, creating pulses that the microprocessor on the main P.C. Board counts. The game programming counts the pulses, and converts these into numbers which are used to position the chassis and turn the motors on or off. When the game is first powered up, there is no way for the sensors to know where the chassis or turntable is positioned. For this reason there are

black areas at the limits of travel on both the linear and rotary decals. When the game is first powered up, the gear motors will run until the chassis and turntable move to a position where the sensors see the black areas. This lets the microprocessor get a "homing" position for both linear and rotary positioning. The game then "knows" where it is.

The game incorporates a through beam infra-red optical detection system for counting balls that go through the hoop. The system uses pulse technology to reject ANY light that does not conform to the requirements set forth by the electronics contained within the sensors. This eliminates annoying problems that can sometimes affect optical sensing systems.

The game also uses a 'Ball In Play' transmitter and receiver located at the front of the frame to sense balls as they are thrown into the game. This is used to help determine the percentages that are displayed on the statistics screen at the end of the game. This optical sensor also uses pulse technology to ensure reliable operation.

The ball gate uses micro switches to determine positioning of the gate, which are activated by the cam on the ball gate shaft

All of the gear motors use a combination of hardware and software control to protect against over current damage. When an over current condition is detected, the motors will shut off automatically. The game microprocessor will then decide whether or not the motor should be turned on. It will also determine at that time which way the motor should run.

## MECHANICAL REPAIR

IMPORTANT: USE ONLY I.C.E. REPLACEMENT PARTS WHEN SERVICING YOUR GAME. USING NON-I.C.E. APPROVED PARTS COULD VOID YOUR WARRANTY, AND COULD CAUSE SERIOUS DAMAGE TO THE GAME, OR INJURY TO OTHERS.

IF YOU HAVE ANY QUESTION REGARDING REPAIR AFTER READING THIS SECTION, CALL OUR SERVICE DEPARTMENT BEFORE PROCEEDING AT 1-800-342-3433

WARNING: OBSERVE ALL SAFETY PRECAUTIONS WHEN WORKING ON THE COLOR MONITOR. DISCHARGE CURRENT FROM THE MONITOR IN ACCORDANCE WITH PROCEDURES WHICH CAN BE FOUND IN THE MONITOR SERVICE MANUAL.

# MAINTENANCE & TROUBLE SHOOTING

WHEN WORKING ON THE MOVING BASKET DEVICE OR BALL GATE MECHANISM, IT IS EXTREMELY IMPORTANT TO REMOVE BATTERY POWER FROM THE GAME, AS WELL AS A.C. POWER. THE BATTERY POWER CAN BE REMOVED EITHER BY DISCONNECTING 1 LEAD FROM THE BATTERY, OR REMOVING THE 2 PIN MATE-N-LOCK CONNECTOR FROM THE MAIN P.C. BOARD.

## BALL GATE SERVICE.

- Re- both battery and A.C. power
- Cut all the tie wraps that hold the fabric side panels to the game.
- Remove the 4 bolts that hold the frame to the cabinet.
- Move the cabinet away from the frame.
- Remove the two bolts that hold the front of the ball gate bearing in place. (HINT: a long extension on a ratchet can be helpful for this operation.)
- Pull the ball gate from the end by the bearing towards you ( the rear of the game ).
- The gear motor can now be pulled away from the retaining bracket
- Unplug the mate-n-lock connector from the game harness, and remove the ball gate assembly.
- Remove the 2 allen head set screws, to remove the ball gate from the gear motor.
- Remove the 41 screws and star washers to remove the micro switch mounting bracket from the gear motor.
- NOTE: When removing wires from the micro switches or motor, It is VERY Important to make sure all wires are returned to their proper terminals. Failure to do this will result in improper operation of the ball gate, and could damage the game. The wires are color coded, so it will be easy to document where each wire goes.
- IMPORTANT: Mark the position of the micro switch mounting bracket so the switch actuators will line up correctly with the cam on the ball gate when the unit is re-assembled.
- Use thread locking compound on the allen head set screws when re-assembling the ball gate to the gear motor.
- Assemble in reverse order of disassembly. Tighten all hardware securely.
- Be sure to test the ball gate unit, BEFORE installing the side panels.
- Fasten the side panels to the front of the frame, using the Velcro strips provided.
- Bolt the cabinet and frame together and tighten securely.
- Tie wrap the side panels into position, and cut off any excess.
- RE test for proper operation.
- Temporarily shut off A.C. Power, reconnect Battery, and turn A.C. Power back on.

## SERVICING FOR :

ROTARY & LINEAR GEAR MOTORS  
FRICTION CLUTCH  
ROTARY & LINEAR SENSORS (ENCODERS)

- Remove both battery and A.C. power.
- If the linear (back and forth) motor requires service, the left side panel (as viewed from the front) must be partially removed. Cut the tie-wraps off on the rear and top of the side panel. The front edge should be left attached to the frame. It is not necessary to separate the cabinet from the frame.
- The turntable which supports the basket must be removed to gain access to the gear motors.

IMPORTANT: USE THE EXACT SAME SPACER ARRANGEMENT WHEN REPLACING THE ENCODER SENSORS. FAILURE TO MAINTAIN PROPER SPACING COULD RESULT IN THE INABILITY OF THE SENSORS TO READ THE ENCODER DECALS.

- a) Remove the backboard & basket by removing the bolt that holds the post to the turntable.
- b) Disconnect the harness from the optical sensor.

# MAINTENANCE & TROUBLE SHOOTING

## ELECTRONIC AND ELECTRICAL REPAIR

The following section will describe repair procedures and trouble shooting hints for the game electronics.

Please read the section "Operational Background" in the beginning of Maintenance and Trouble Shooting to get a good understanding of the games basic operating parameters.

**WARNING: EXERCISE CAUTION WHENEVER WORKING WITH ELECTRONICS, THEY CAN BE VERY SUSCEPTIBLE TO DAMAGE FROM SEORT CIRCUITING, OR PHYSICAL ABUSE. ALWAYS UNPLUG THE GAME WHEN WORKING ON HIGH VOLTAGE AREAS OF THE GAME, SUCH AS THE TRANSFORMER OR MONITOR.**

USE EXTREME CAUTION WHEN USING VOLT METERS TO DO CIRCUIT CHECKS IF THE GAME POWER HAS BEEN LEFT ON.

ALWAYS REMOVE THE BATTERY BACK-UP POWER WHEN WORKING ON THE GAME. THIS IS NECESSARY, AS SOME CIRCUITS ARE CONSTANTLY UNDER POWER FROM THE BATTERY.

IF YOU MUST HAVE POWER ON WHEN TESTING THE MONITOR, SHUT OFF POWER, UNFASTEN THE MONITOR, AND SET IT UP WHERE IT WILL BE TESTED, EITHER ON THE CABINET OR A TEST BENCH, THEN TURN POWER BACK ON. THIS WILL ELIMINATE THE POSSIBILITY OF ACCIDENTAL DAMAGE OR A SHOCK HAZARD WHEN REMOVING THE MONITOR.

REFER TO THE MONITOR SERVICE MANUAL FOR SPECIFIC INFORMATION ON MONITOR SET-UP, ADJUSTMENT, OR REPAIR.

WHEN USING A VOLT METER, BE SURE IT IS SET TO THE CORRECT VOLTAGE OR RESISTANCE RANGE, **BEFORE** USING. THIS CAN PREVENT POSSIBLE DAMAGE TO THE P.C. BOARD OR MISDIAGNOSIS.

ALWAYS REMOVE POWER TO THE GAME WHEN PLUGGING OR UNPLUGGING P.C. BOARDS.

IT IS NECESSARY TO USE I.C.E. REPLACEMENT PARTS TO CONTINUE WARRANTY COVERAGE. USE OF NON-I.C.E.. APPROVED PARTS WILL NOT ONLY VOID YOUR WARRANTY, BUT COULD CAUSE SERIOUS HARM TO THE GAME, OR CAUSE SERIOUS BODILY INJURY.

IF YOU HAVE ANY QUESTIONS REGARDING REPAIR AFTER READING THIS SECTION, CALL OUR SERVICE DEPARTMENT AT 1-800-342-3433 BEFORE PROCEEDING.

## FUSES

Fuses are the first thing that should be checked when the game either appears not to work, or to work incorrectly.

There are 4 fuses in the game. 2 of them are located in the power entry module, where the power cord enters the game.

To check or service the fuses in the power module, first remove the power cord. Then, using a small flat blade screwdriver, pry the fuse block from the power module. Pull the fuse holder from the fuse block, and test the fuses. Be sure to replace the fuses with the same value.

There are 2 fuses located on the main P.C. Board. These protect the low voltage sides of the game, the 5 volt and 12 volt sides. Be sure game power is off when checking or replacing these fuses. Replace the Main P.C. Board fuses with the original value.

## TRANSFORMER

YOU MUST REMOVE ALL A.C. POWER FROM THE GAME WHEN SERVICING THIS COMPONENT. IT IS A GOOD IDEA TO ACTUALLY REMOVE THE POWER CORD FROM THE WALL OR FLOOR OUTLET WHEN CHANGING THE TRANSFORMER.

CAREFULLY document where each color wire goes, BEFORE removing any wires.

Remove the 4 screws that hold the transformer to the cabinet bottom.

Replace and reconnect the transformer.

TAKE ANY FAST-ONS THAT WERE ON THE OLD TRANSFORMER TO COVER THE UNUSED A.C. TERMINALS OFF, AND TRANSFER THEM TO THE NEW TRANSFORMER. THIS IS NECESSARY, AS THE LEADS ON THE TRANSFORMER. HAVE POWER ON THEM.

## CHANGING A.C.. VOLTAGES

When you receive your game from the factory, it should already be set to the proper A.C. voltage. If for some reason however, it needs to be set to a different A.C. voltage, follow these directions.

# MAINTENANCE & TROUBLE SHOOTING

Unplug the game from the A.C. outlet.

The A.C. input taps for the transformer are located on the front left hand side of the transformer, as viewed from the opening of the access door.

The A.C. taps can be further identified by the fact that there are 5 taps in a row. (The only place on the transformer where there are 5 taps in a row.)

The bottom tap is the 0 volt tap. One side of the A.C. line should always be left attached to this terminal.

The 5 taps FROM THE BOTTOM OF THE TRANSFORMER UP are as follows:

240 V.A.C.  
210 V.A.C.  
115 V.A.C.  
90 V.A.C.  
0 V.A.C.

These numbers are also indicated on the transformer itself.

The A.C. wire that is on one of the above taps, is the only wire you should move. Please use a blank fast-on, on any open terminals, to protect against shock hazards.

## MAIN P.C. BOARD

**IMPORTANT:** BEFORE REMOVING THE MAIN P.C. BOARD OR CHANGING THE MEMORY BATTERY, GO INTO THE GAME OPTIONS SCREENS, AND RECORD ALL CUSTOM GAME SETTINGS, SO THEY CAN BE RE-ENTERED AFTER SERVICING HAS BEEN COMPLETED.

Remove all A.C. power before removing the Main P.C. Board.

**Disconnect** all Mate-lock connectors from the P.C. Board.

Remove the four retaining fasteners, and remove the P.C. Board.

Install in the reverse order.

If installing a new memory battery or new P.C. Board, after installation, reset all custom game programming into system memory.

## B.I.P. SENSORS

The B.I.P. (ball in play) sensors, are actually a pair of 2 different types of sensor. One is an infrared transmitter, and the other a receiver.

The transmitter has a power L.E.D. mounted on the end of the P.C. Board, opposite the end that the harness is attached to. If that L.E.D. is lit, there is a very good chance that the circuit is working properly. If you need to be sure, you can purchase an I.R. detector card from Radio Shack Part No. 276-099. Follow the instructions on the back of the card. You will only see the reflection dimly, however it will prove that the transmitter is working properly.

The receiver has a test L.E.D. located on one end of the P.C. Board. Once you have determined that the transmitter works properly, you can test the receiver. If you wave your hand between the sensors, the LED should go out for as long as the beam is broken.

If either of the sensors do not appear to be working properly, do the following . . . . .

Remove the mate-lock connectors that connect the sensor harnesses to the game.

Unbolt the sensors from either the back of the cabinet, or the top of the framework.

The sensors are both mounted in 1"x2" black tubular steel enclosures, and can be removed from the enclosures by removing the five screws that hold them in place.

Replace the defective sensor with a new part and re-assemble the unit

**NOTE:** WHEN INSTALLING THE RECEIVER P.C. BOARD, MAKE SURE IT IS TIE-WRAPPED TO THE PIPE SECURELY. TIE-WRAP THE WIRING TO THE REAR SIDE OF THE PIPE WHERE IT IS NOT VISIBLE, OR PRONE TO BE HIT BY THE BALL

## BALL SENSORS

The ball sensors are a through beam infrared pair. To test, walk into the game, and pass a ball through the hoop when a game of "HOT SHOT" is being played. (Choose HOT SHOT because the basket will only move once during the course of the game.)

# MAINTENANCE & TROUBLE SHOOTING

When you pass the ball through the hoop, you should hear the swish sound from the game. If you hear the sound, the sensors are good.

If you do not hear the sound, check the transmitter sensor with an I.R. Detector card (Radio Shack part no. 276499). The transmitter is the unit with the lit I.R. diode in it. If you do not see any reflected I.R. light, do a voltage check to be sure the sensors are receiving power. If the sensors are not receiving power, fix the power problem and proceed.

If you see reflected I.R. light perform a continuity check to make sure the signal from the I.R. receiver is getting back to the main P.C. Board.

If you have no reflected light when it has been established that there is power, you have a defective TRANSMITTER.

If you have reflected light, and have established that the wiring between the receiver and Main P.C. Board is good, there is a high probability that the receiver is bad.

There is one final check you can make to be sure the problem is not in the Main P.C. Board. Use a wire jumper or paper clip and jump between pins 12 & 14 on the P3 connector of the Main P.C. Board. If you do this when a game is in progress, a "swish" sound should be heard each time you MOMENTARILY jump those terminals. If the sound is heard, and the wiring to the sensor is good, and the transmitter works correctly, then the receiver is definitely bad.

If you need to replace either of the sensors, refer to the "Hoop Sensor Replacement" section in the mechanical repair area for directions on how to replace the sensors.

## ROTARY / LINEAR SENSORS

The Rotary / Linear sensors can be checked easily. Put the game into the options mode (as described earlier in this manual), and enter the "Bum In Self Test" mode. You will notice 2 sets of numbers on the monitor screen. These numbers should change when the basket changes position. You will notice a correlation between the numbers and which axis is moving (rotary or linear). If either set of numbers do not move when the basket moves this will prove there is a problem with one of the sensors. This should however be obvious as to which sensor is bad however, because that particular axis should not be working correctly. Example: If the numbers are not moving for the linear drive, the linear drive itself should also be a) not moving correctly or b) not moving at all. If not moving at all, see if the numbers change if you move the chassis or turntable by hand (you could have a bad gear motor).

## MONITOR

Refer to the monitor service manual at the rear of this manual for information on service and repair.



# OPTIONAL ACCESSORIES

## OVERVIEW

IF YOU DO NOT FIND ANSWERS TO YOUR QUESTIONS IN THIS SECTION, REFER TO THE ACCOMPANYING MANUAL FOR YOUR PARTICULAR PRODUCT, FOR CALL OUR SERVICE DEPARTMENT AT 1-800-342-3433

## CARD DISPENSER

Refer to the supplied manual for all information, other than software settings.

The card dispenser software is set up at the factory to dispense 1 card for each game played. You can however change this by entering the "GAME OPTIONS" screen and adjusting the award parameters. If you set the winner option, only the winner of MULTIPLE PLAYER games will get an award, if the other award options are set to "0". You can in addition set the threshold option which means a player would have to get XX points before a card would be given.

To dispense 1 card per player per game, set the "JUST FOR PLAYING" option to '1', and all other award options to '0'.

The "GAME XX POINTS PER AWARD" option should be kept at "0" at all times, unless you want to dispense a card for every XX points scored.

Your card dispenser should be cleaned every time you put more cards in it. This is because the cards leave debris on the rollers, which will make them slippery, and not dispense properly.

Blow out as much of the paper dust as possible. Use a rubber rejuvenator on a clean cloth, and wipe all the rubber roller contact surfaces.

If the cards have a bend to them, the bend should face the rollers, so there is maximum contact being made.

If the unit does not work at all, be sure the game software options are set correctly, and that the dispenser is receiving 12 volts D.C.

## TICKET DISPENSER

Refer to the supplied service manual for all information, other than software settings.

The ticket dispenser comes pre-set from the factory to dispense 1 ticket for every 5 points scored. In addition to this, if the game player did not score enough points to get 1 ticket, the game is preset to give the player 1 ticket just for playing.

These settings can be adjusted by changing the ticket options in the "GAME OPTIONS" mode. If you change the memory battery or main P.C. Board, you may have to reset the values for these options.

You can dispense a different amount of tickets for each game by adjusting the "GAME XX POINTS PER AWARD" setting. For instance, since it is easier to score playing "HOT SHOT" than it is playing "QUICK SHOT", you may wish to give out less tickets per point on "HOT SHOT" than on "QUICK SHOT". Example 1 ticket per 5 points on "QUICK SHOT", and 1 ticket per 8 points on "HOT SHOT".

You can also set the game up so that the winner of MULTIPLE player games ONLY, wins tickets, or that a certain amount of points must be scored BEFORE ANY tickets will be dispensed. This is the threshold option.

## BILL VALIDATOR

Refer to the supplied manual for all information other than software settings.

The validator normally requires no adjustments other than checking to see that the proper voltage is present. This validator runs on 12 volt D.C. power, with a minimum of 11.5 vdc D.C. The validator will not work correctly with voltages below that specified.

The validator may work strangely, or not at all if it is grounded improperly.

The unit should be cleaned periodically to ensure proper operation. Blow out as much dirt as possible, then use a cotton swab (q-tip) to get into the front opening to remove any remaining dirt or debris.

Clean the stacker belts with a rubber rejuvenator. Clean any other dirt from the unit with isopropyl alcohol.

The game comes from the factory pre-set at 2 credits per bill. You can change this by entering the "GAME OPTIONS" screen. (see GAME OPTIONS settings section for more information.)

# PARTS LISTINGS

## MECHANICAL PARTS LISTINGS

BB1000 DRIVE RAIL WITH RACK GEAR  
 881001 CHASSIS SLIDE RAIL  
 BB1002 TURNTABLE (WITH POLE)  
 881003 BACKBOARD MOUNTING BRACKET  
 881004 TURNTABLE CHASSIS  
 BB1005 COIN DOOR PANEL FRAME  
 BB1007 ACCESSORY DOOR  
 BE1008 CASH BOX DOOR  
 BB1013 CABINET TOP PANEL  
 881016 MONITOR MOUNTING BRACKET  
 BB1017 MONITOR ADAPTER BRACKET  
 BE1018 SENSOR HOUSING  
 BB1020 BALL RETURN MOUNTING EKT.  
 BB1022 BALL GATE  
 BE1023 BALL GATE MOTOR MTC. BKT.  
 BB1024 MICRO SWITCH MOUNTING BKT.  
 BB1025 EXTENSION POLE  
 EB1034 CLUTCH (XIC-1803)  
 BB1036 TURNTABLE STOP BRACKET  
 881037 RACK GEAR GUARD  
 BB1039 HOOP (2043-0) 3/8 X 13"  
 BB1041 CABLE SUPPORT CHANNEL  
 BB3001 7" BASKETBALL  
 BB3002B BACKBOARD  
 BE3003 TURNTABLE COVER  
 BB3004 NET SENSOR RING  
 BB3005B MONITOR FACE PLATE  
 BB3006 RAIL BEARING  
 883007 RAIL BEARING PLATES  
 BB3008 HOOP NET 13"  
 BB3009 FRAME NETTING  
 BB3012 VINYL SIDE COVER, LEFT  
 BB3012A VINYL SIDE COVER, RIGHT  
 BB3013 REBOUND GUARD  
 BB3014 CABINET SIDE PANEL  
 BB3017 BALL GATE BEARING MTG. PLATE  
 BE301 a BALL GATE BEARING  
 EB3019 MOTOR NOISE COVER  
 BE3020 MAGNETIC STRIP  
 BE4001 VELCRO (HOOK)  
 BB5001 SYSTEM4 CASH BOX  
 5014 DOOR LOCKS

## HARDWARE

HH3031 1' GROMMET (GRO-1-VL)  
 3036B FACE PANEL WASHER .875X 5/16  
 3039 2" GROMMET (BP2)  
 348 TIE WRAP, 5" WHITE  
 351 TIE WRAP, 21" WHITE

352  
 SK403  
 BB6001  
 PC60601  
 BE9004

TIE WRAP, 8" BLACK  
 BUMPER STOP  
 BALL TRANSFERS (M-2200)  
 FACE PANEL BOLT 1/4-20 X 5/8  
 BOELUBE PUSH STICK RAIL LUBRICANT

## DECALS

887001 PROGRAMMING DECAL  
 BE7002 MONITOR BEZEL  
 BB7004 POWER DISCONNECT WARNING  
 BB7005 F.C.FRENY CABINET SIDE DECAL  
 BB7006 LINEAR TRACK ENCODER DECAL  
 BB7007 ROTARY ENCODER DECAL  
 BB7010 MONITOR WARNING LABEL  
 BB9001 OPERATORS SERVICE MANUAL

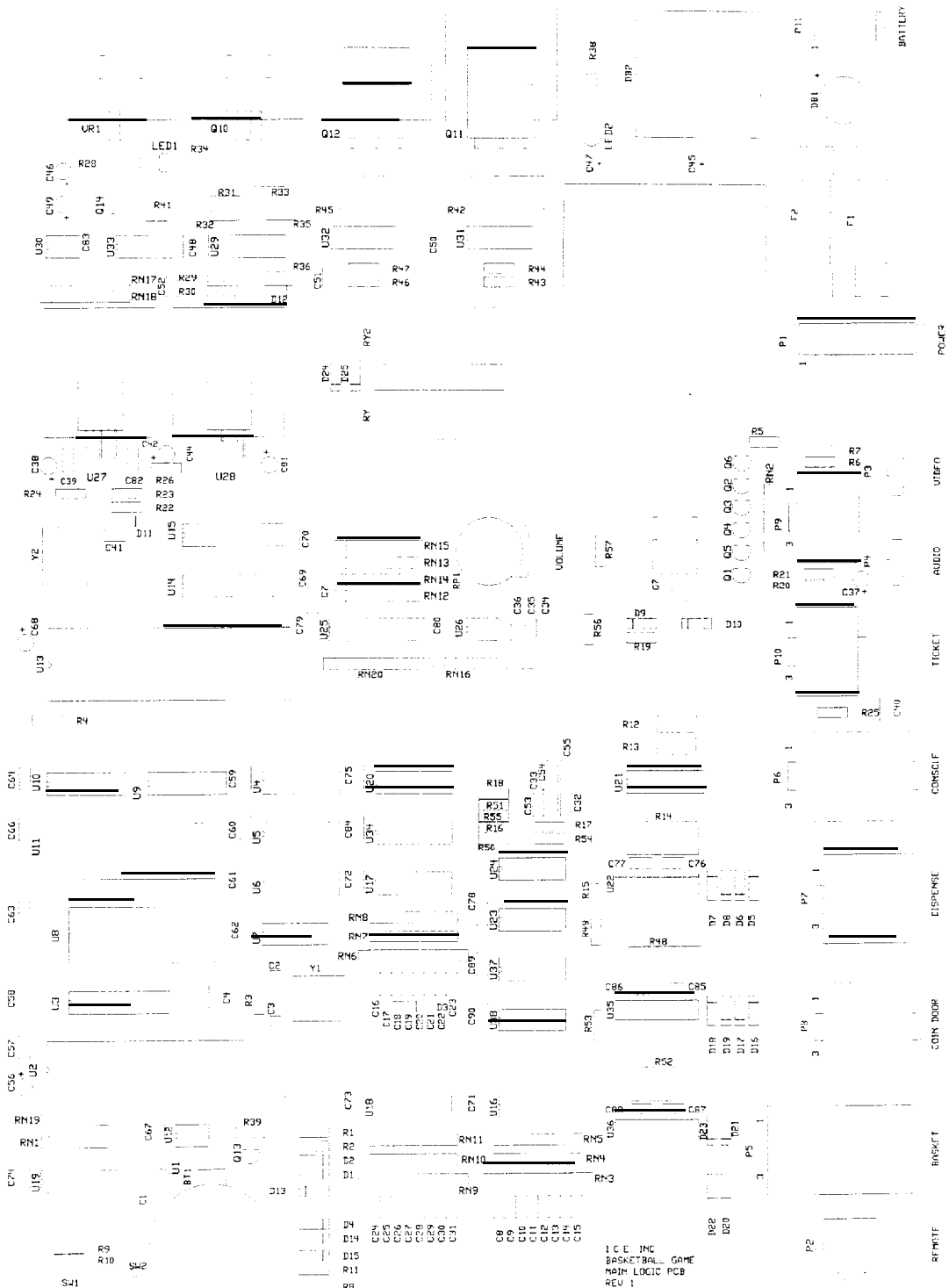
## ELECTRICAL PARTS

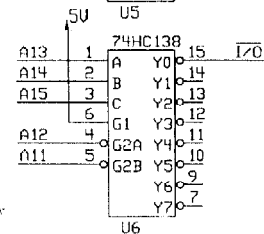
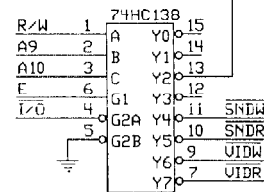
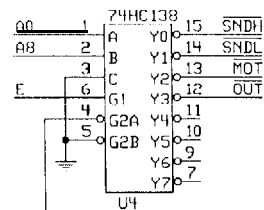
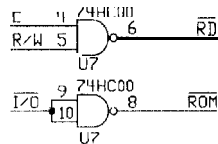
BE2002 TRANSFORMER  
 BB2004 BASKETBALL PUSH BUTTON  
 BB2005 MICRO SWITCH (CHERRY D-44)  
 BB2006 POWER ENTRY MODULE  
 BE2007 SPEAKER  
 BB2008 BALL GATE MOTOR  
 BB2009 ROTARY GEAR MOTOR  
 BE2010 LINEAR GEAR MOTOR  
 BB2016 BATTERY, 12 VOLT (PS1242)  
 BB2018X CHASSIS HARNESS  
 BB2019X MAIN CABINET HARNESS  
 BB2020X MOTOR SHAFT HARNESS  
 BB2021X BACKBOARD HARNESS  
 BB2022 FLOOD LAMP SOCKET  
 BB2023 FLOOD LAMP BULB 150WATT  
 BB2025X TRANSFORMER HARNESS  
 BB2026X PANEL SELECT HARNESS  
 BB2027X BALL IN PLAY RECEIVER HARNESS  
 BB2028X BALL IN PLAY TRANSMITTER HARN.  
 BB2029X GATE ASSEMBLY HARNESS

## ELECTRONIC PARTS

BE2001 MAIN P.C. BOARD  
 BB2003 19" COLOR MONITOR  
 BE2011X NET SENSOR RECEIVER  
 BE2011 x NET SENSOR, TRANSMITTER  
 BB2012 BALL IN PLAY TRANSMITTER P.C.B.  
 BB2013 BALL IN PLAY RECEIVER P.C.B.  
 BB2014 POSITION ENCODER P.C.B.

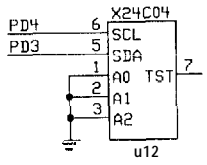
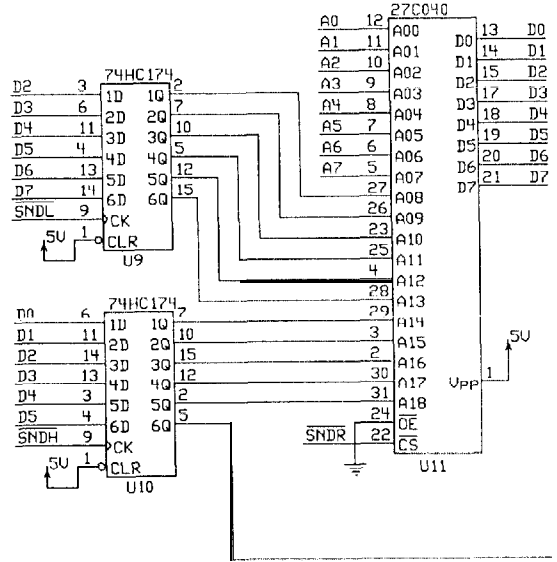
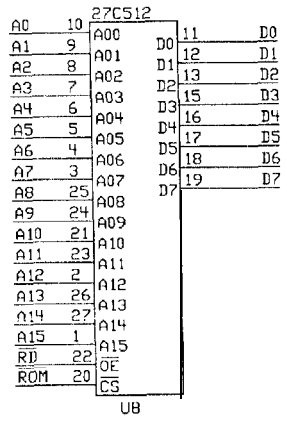




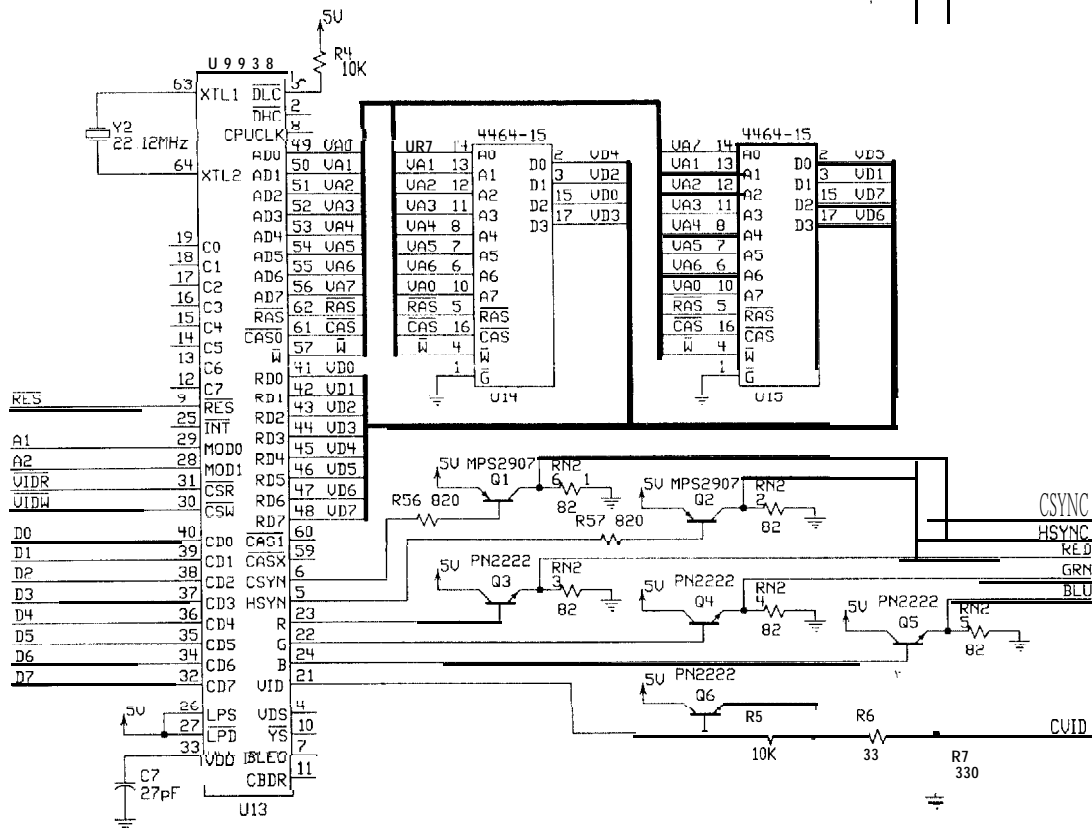


REV 1		I.C.E. Inc.	
prepared 11/92	GHD	BASKETBALL GAME MAIN LOGIC PCB	
checked		size code id	drawing no
engineer		A no.	
		scale	sheet 1 of 1

revisions				
zone	ltr	description	date	approved



REV 1			I.C.E. I n c .		
prepared	11/92	GHD	BASKETBALL GAME		
checked			MAIN LOGIC PCB		
engineer			size	code id	drawing no.
			A		
			scale		sheet 2-11



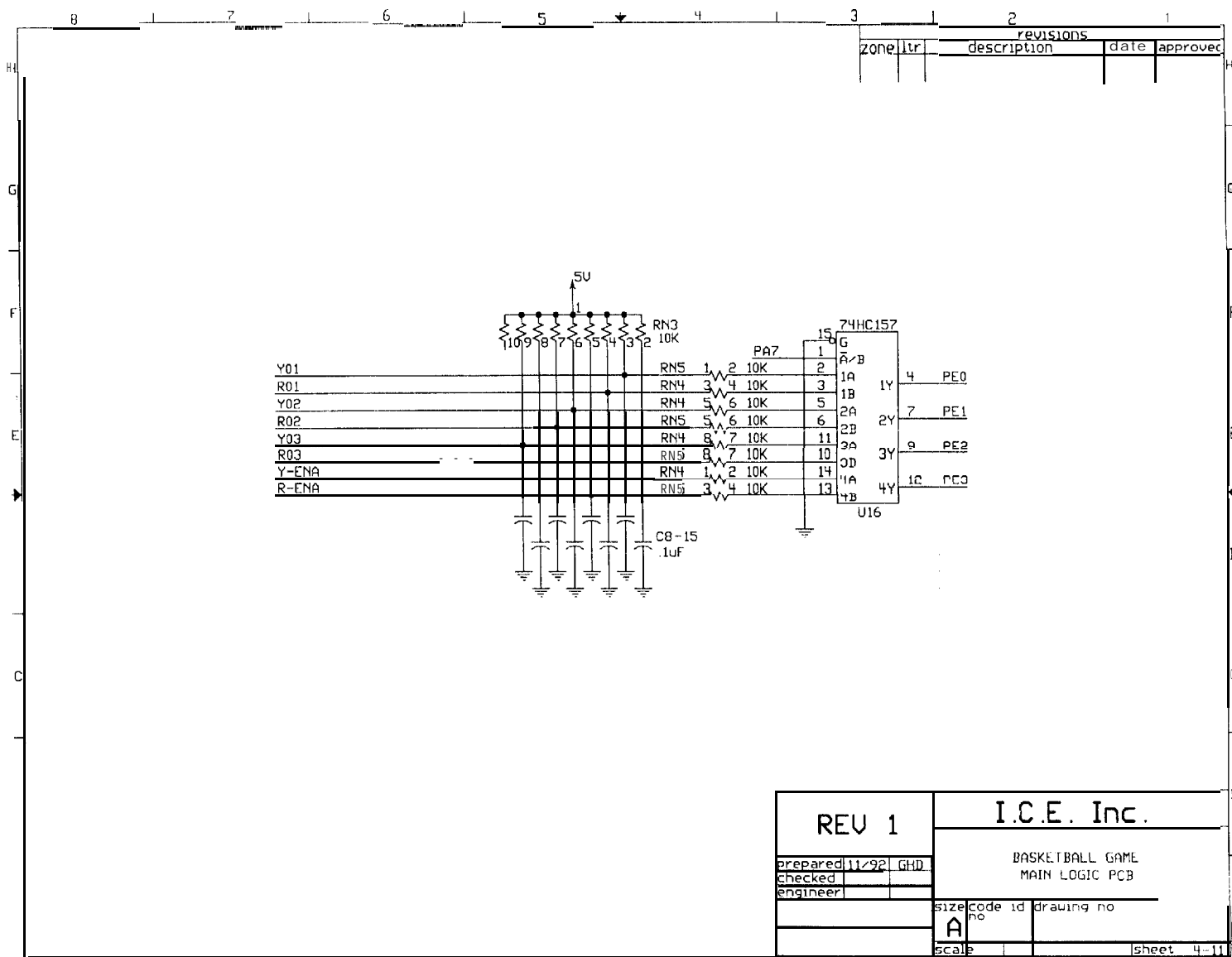
REV 1

I. C. E. Inc.

prepared 11/92 GHD  
checked  
engineer

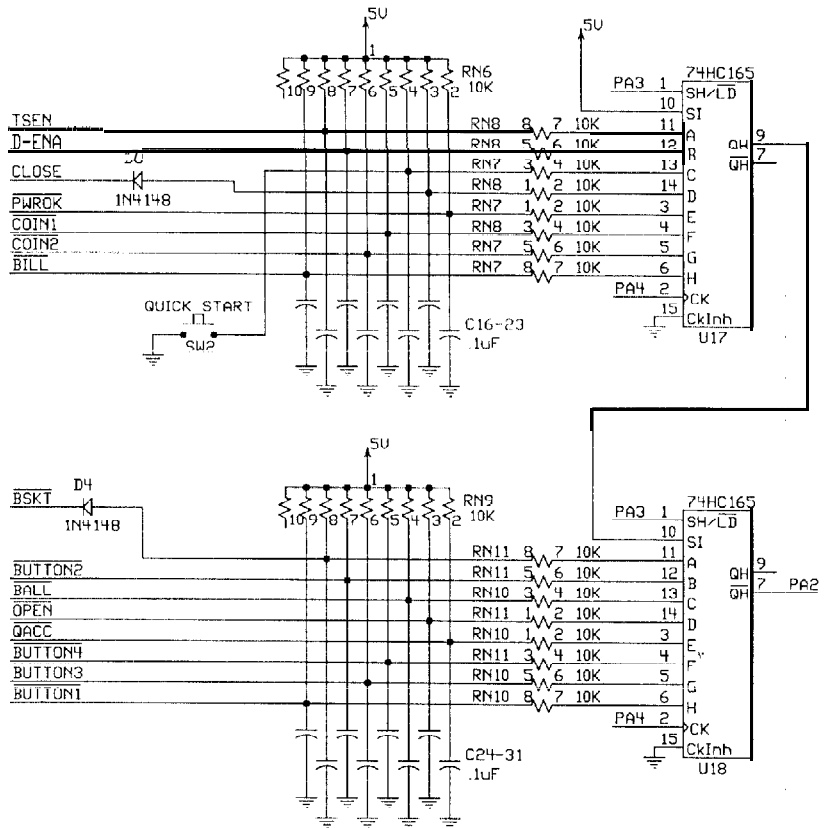
BASKETBALL GAME  
MAIN LOGIC PCB

size code id drawing no  
no

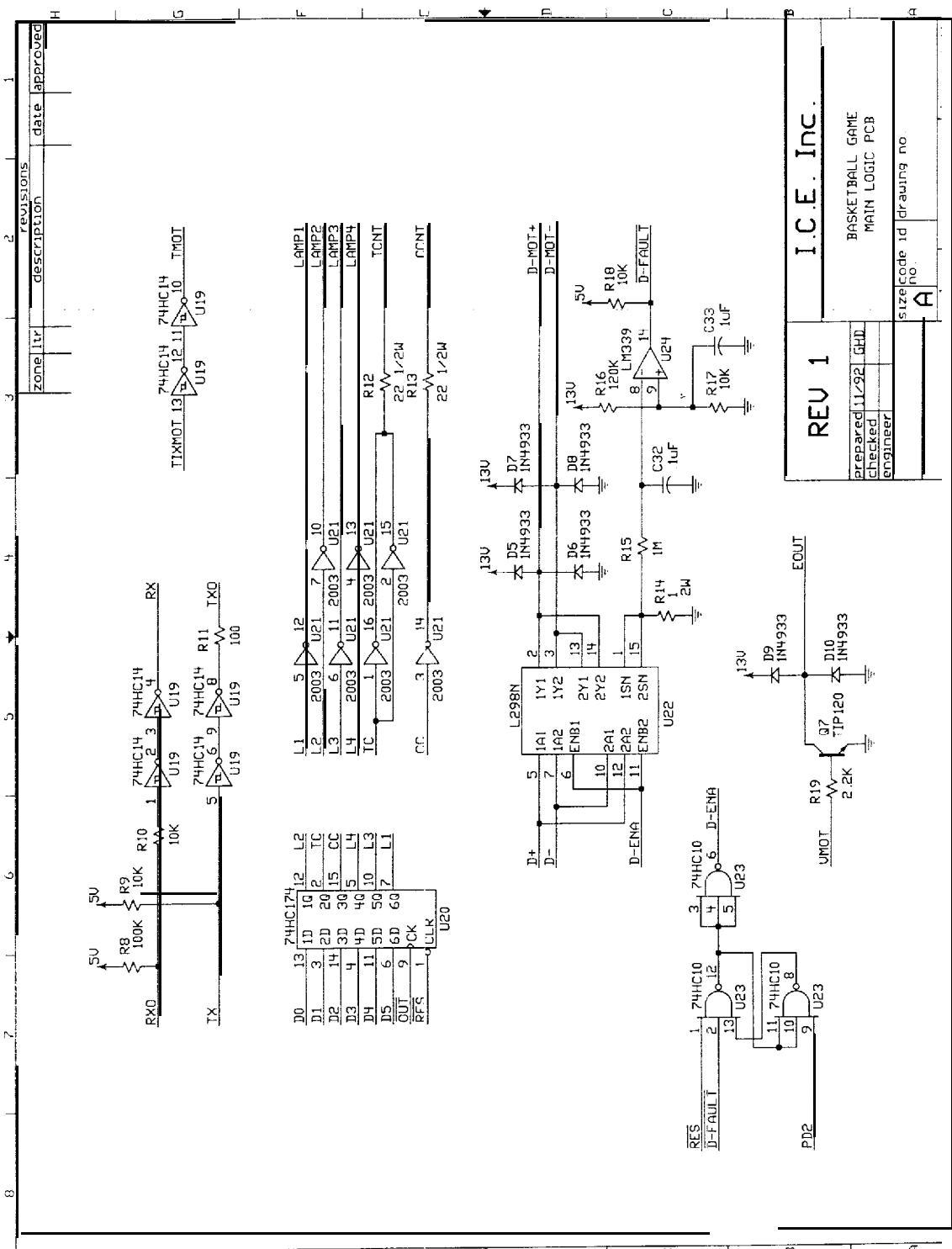




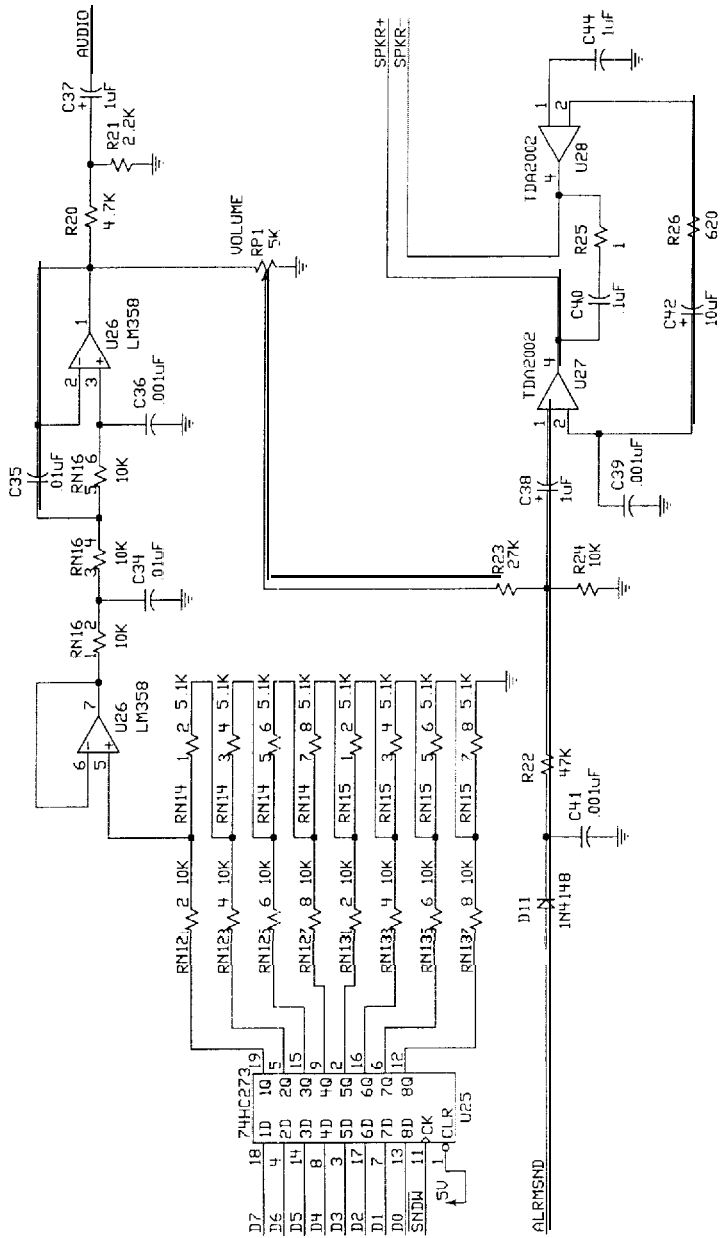
0	7	6	5	4	3	2	1	
						revisions		
zone		ltr		description		date	approved	



REV 1		I.C.E. Inc.	
prepared	11/92 GHD	BASKETBALL GAME	
checked		MAIN LOGIC PCB	
engineer			
size	code	id	drawing no.



zone	tr	description	date	approved
</				



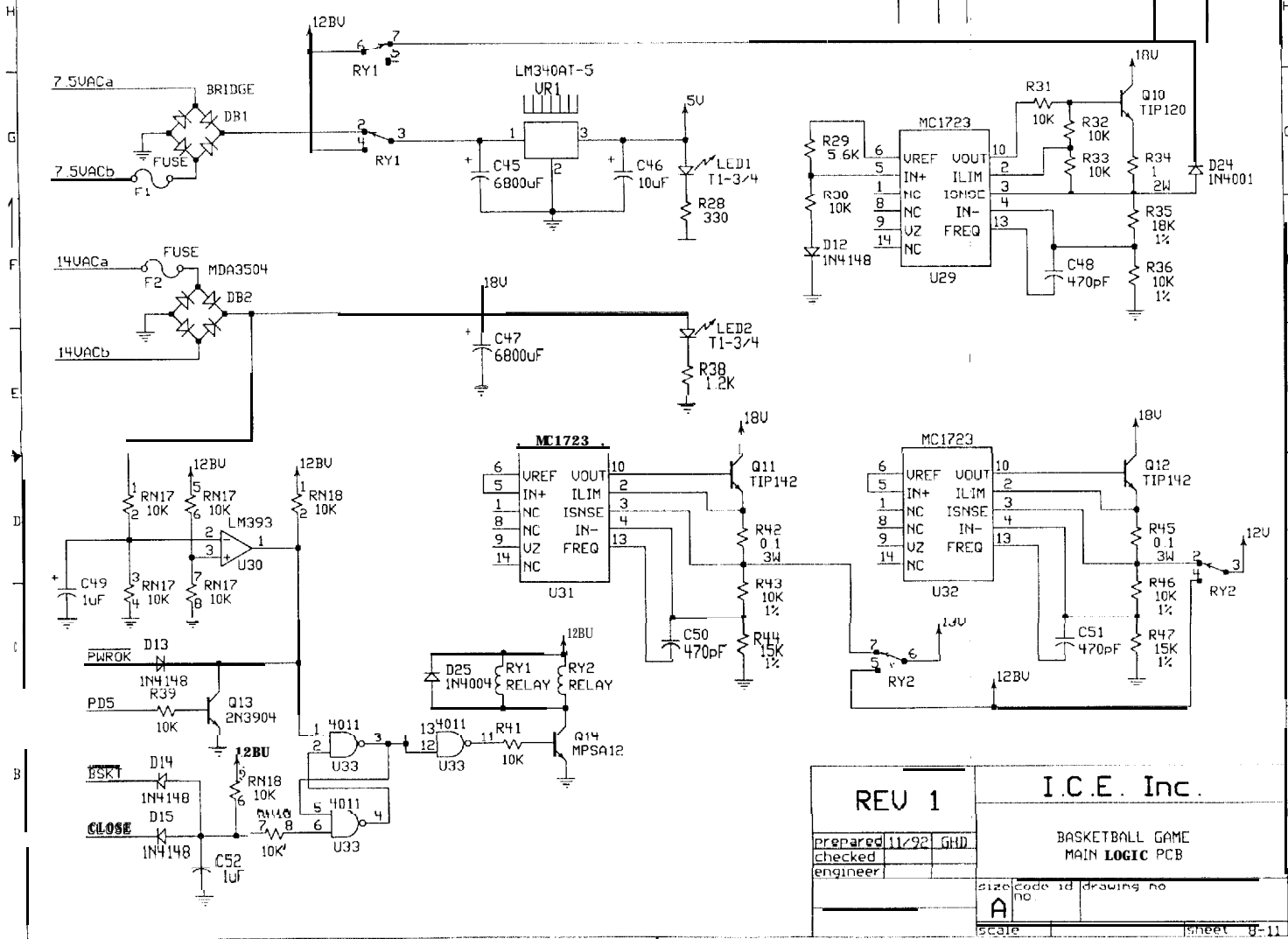
REV 1

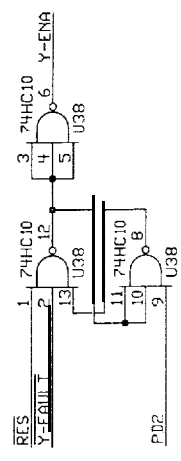
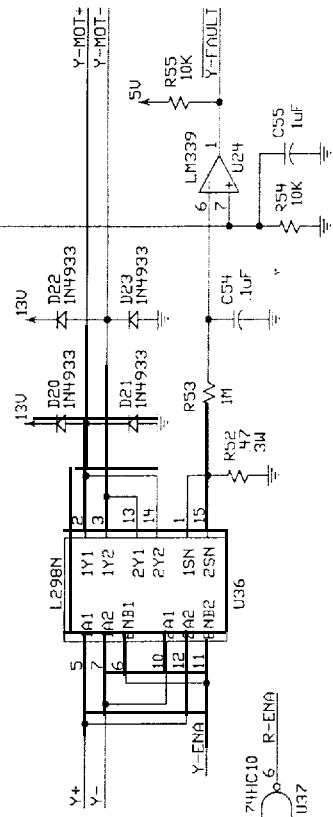
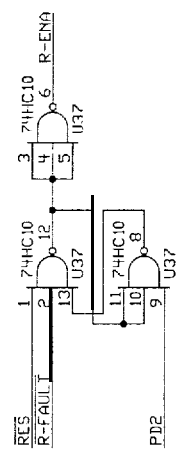
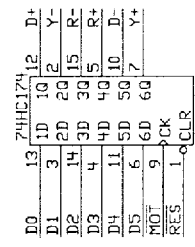
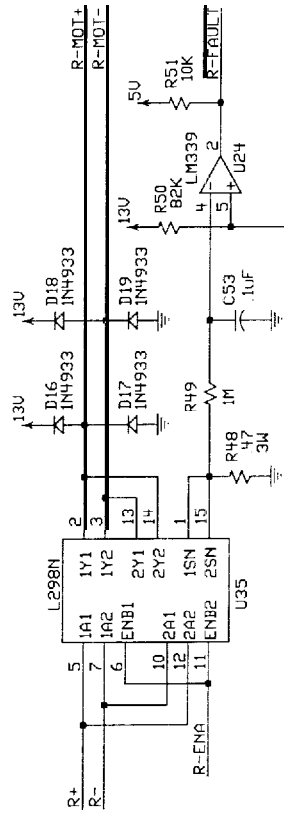
I.C.E. Inc.

BASKETBALL GAME  
MAIN LOGIC PCB

prepared 11/92 GHD  
checked  
engineer

size code id drawing no



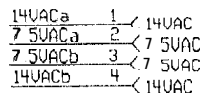


REV 1		I.C.E. Inc.	
Prepared	11/92	GHD	
Checked		engineer	
BASKETBALL GAME		MAIN LOGIC PCB	
size		code	id drawing no

zone	ltr	revisions		date	approved
		description			

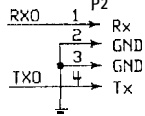
## POWER

P1



## REMOTE

P2



P3

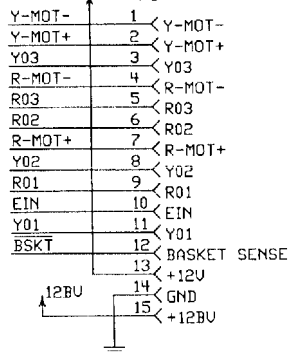
CUID COMPOSITE VIDEO OUTPUT

P4

AUDIO AUDIO OUTPUT

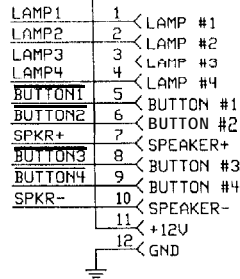
## BASKET

P5



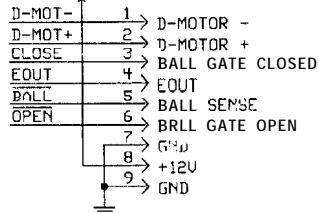
## CONSOLE

12V P6



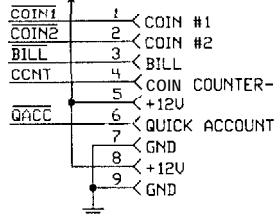
12V P7

## DISPENSE



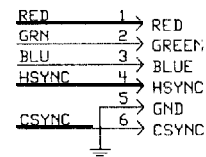
12V P8

## COIN DOOR

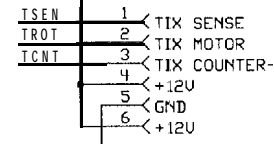


## VIDEO

P9

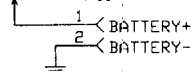


12V TICKET P10



## BATTERY

P11



REV 1

I.C.E. Inc.

prepared 11/92 GHD  
checked  
engineer

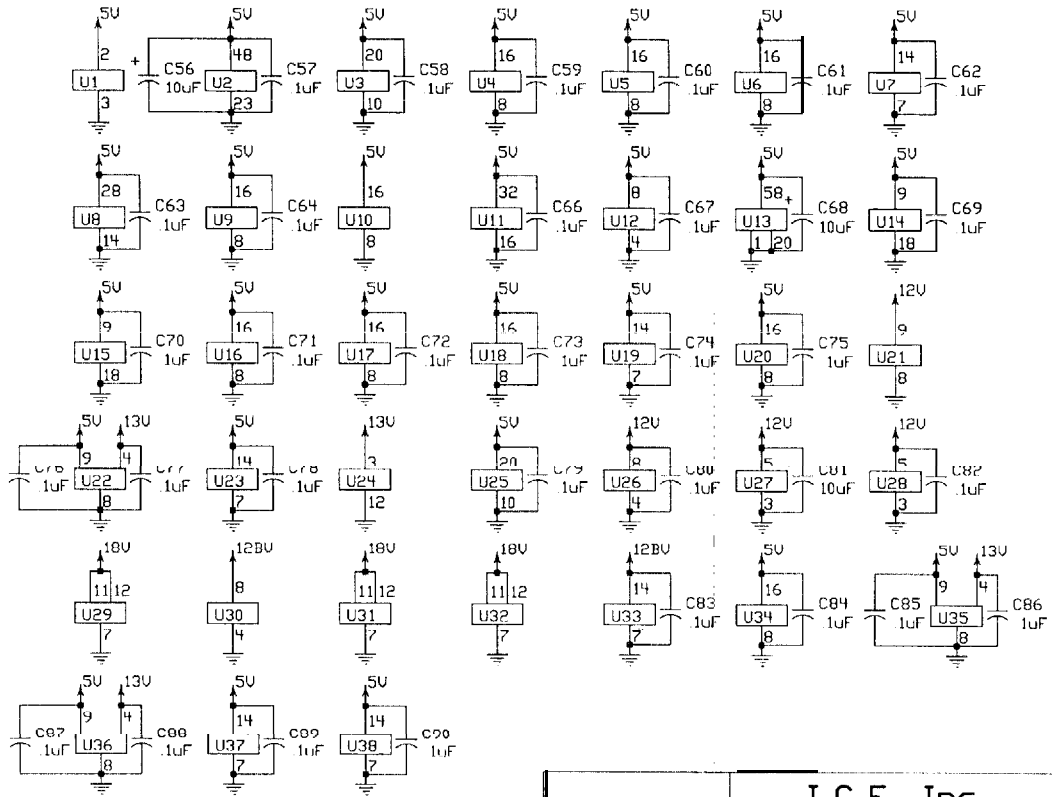
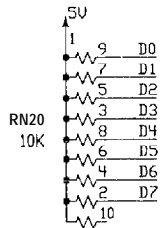
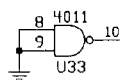
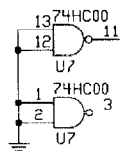
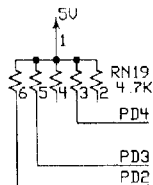
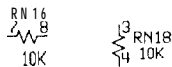
BASKETBALL GAME  
MAIN LOGIC PCB

size code id drawing no.

A

scal sheet 10-11

revisions				
zone	ltr	description	date	approved



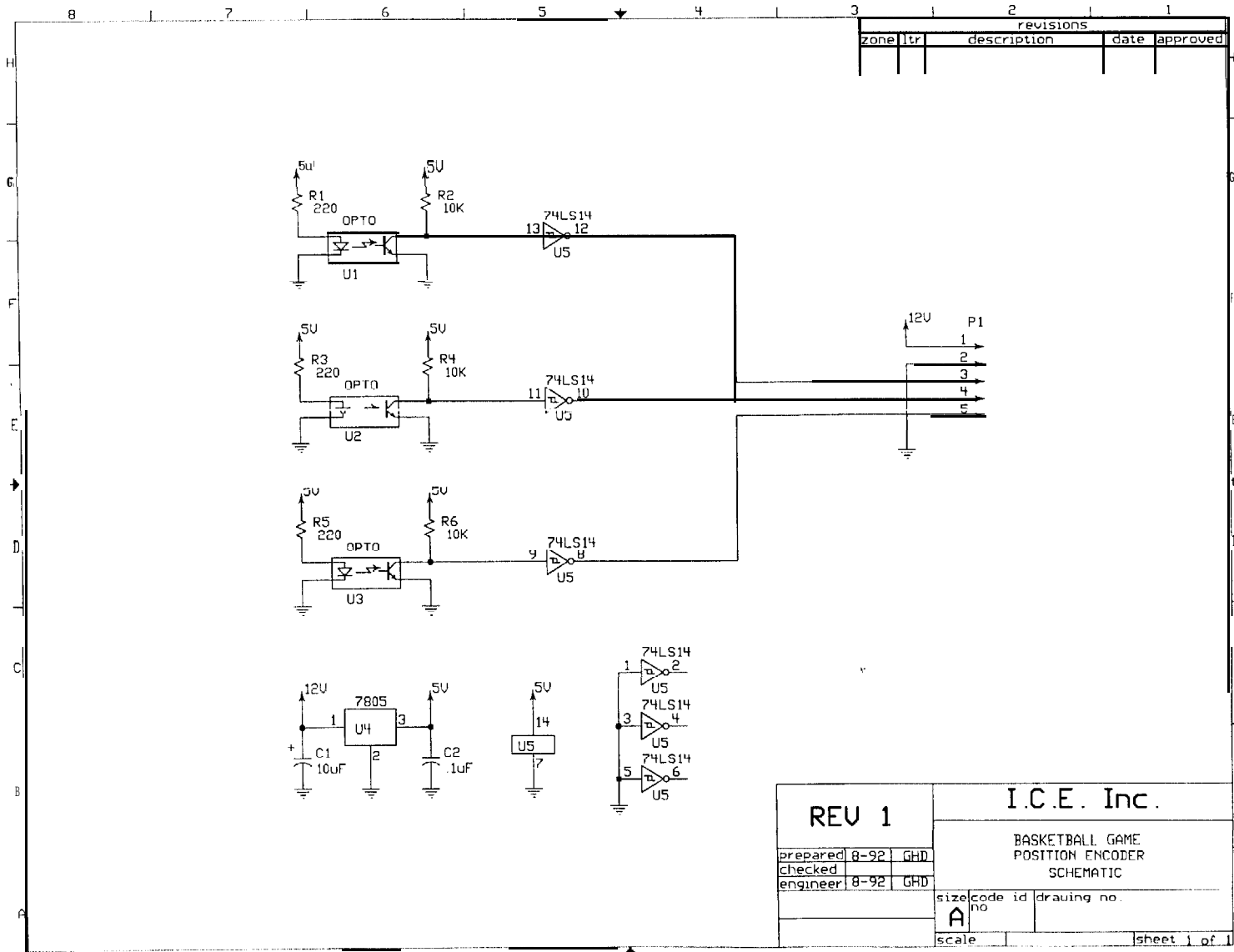
REV 1

I.C.E. Inc.

BASKETBALL GAME  
MAIN LOGIC PCB

prepared 11/92 GHD  
checked  
engineer

size code id drawing no.  
A  
scale sheet 11-11



REV 1

prepared 8-92 GHD  
checked  
engineer 8-92 GHD

I.C.E. Inc.

BASKETBALL GAME  
POSITION ENCODER  
SCHEMATIC

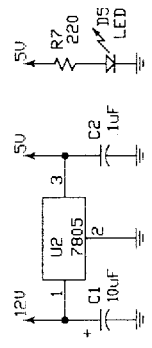
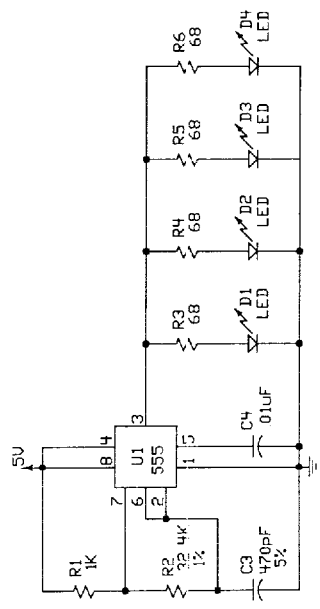
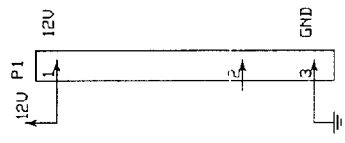
size code id drawing no.  
no

scale

sheet 1 of 1

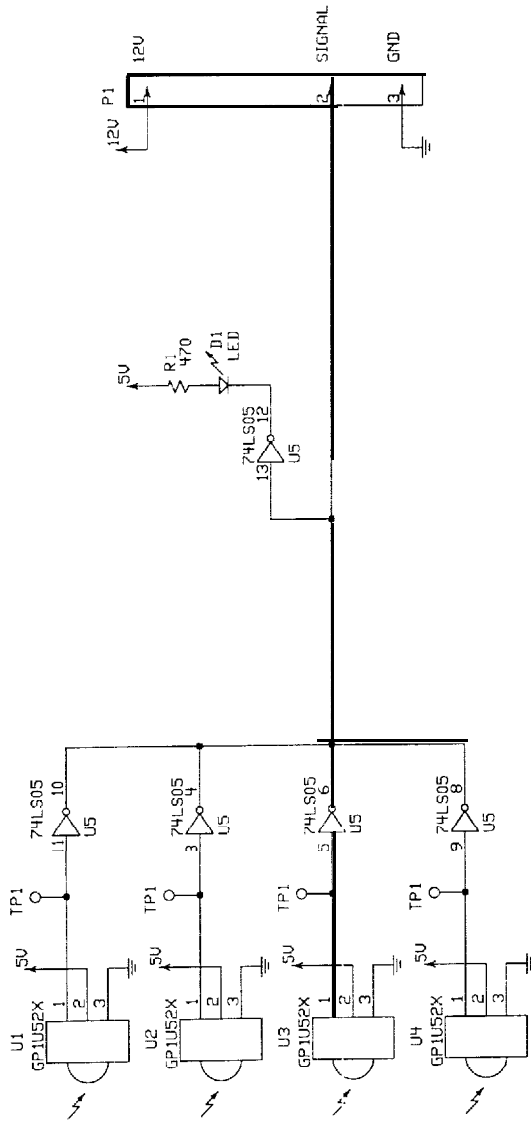


zone		revisions	
itr	description	date	approved



REV 1		I.C.E. Inc.	
Prepared	GHD 8-92	BASKETBALL GAME	
Checked	GHD 8-92	BALL IN PLAY OPTO TRANSMITTER ARRAY	
Engineer	GHD 8-92	SCHEMATIC	
Size		code	id
A		no.	drawing no
Scale		NO.	Sheet 1 of 1

revisions			H
zone	ltr	description	date approved



REV 1	I.C.E. Inc.	
	BASKETBALL GAME	
	BALL IN PLAY OPTO RECEIVER ARRAY SCHEMATIC	
prepared GHD B-92	sizeCode id drawing no	A no
checked		
engineer GHD B-92	A no	
Scale NA		sheet of 1



# THE PRISMATIC

BY  
WELLS-GARDNER

## COLOR SPECIFICATIONS

### CRT

- From 9" to 25" diagonal measure
- P22 phosphor
- Polished faceplate standard; variety of optional faceplates and transmittances available.
- Stripe trio spacings (standard): 0.62 mm (9"), 0.66 mm (13"), 0.82 mm (19"), 0.82 mm (25").
- Optional finer pitches available.

### INPUT SIGNALS

- Video: RGE analog, 1v to 5v peak-to-peak (adjustable with contrast control), 4.7k ohm input impedance, 40 usec to 50 usec active video.
- Optional inputs available:
  - Negative video
  - RGB analog 0-0.75v, 75 ohm input impedance
  - Composite video (NTSC)
- Both composite video and RGB analog Both signal sources can be connected to the monitor at the same time. Monitor display can be switched from one to the other, at anytime at pixel or vertical frame rate.
- Sync: TTL positive or negative going, separate or composite. Input Impedance: 20K ohms for positive going sync; 12K ohms for negative going sync.

### HORIZONTAL SCAN

- Width: Adjustable with just one coil to accommodate active video from 40 usec to 50 usec.
- Frequency: 15.1 kHz to 16.8 kHz standard; higher scan frequencies available.
- Linearity:  $\pm 5\%$

### PICTURE SIZE REGULATION

- $\pm 2\%$

### VERTICAL SCAN

- Frequency: 47 Hz to 63 Hz
- Linearity:  $\pm 5\%$

### GEOMETRIC DISTORTION

- $\pm 2\%$  (max).

### VIDEO CHARACTERISTICS

- Bandwidth (-3 db): 12 MHz typical
- Rise Time: Less than 50 nanoseconds
- Overshoot (max): 5%

### MECHANICAL

- The 19" monitor is also available in universal mount brackets. The monitor can be mounted in the user's cabinet horizontally or vertically. Contact your sales representative for details.
- The standard Prismatic-25" 25" monitor is available as a kit without a frame. Custom frames can be furnished.
- The standard Prismatic-9" 9" monitor is available as a kit without a frame. Also available in chassis form adaptable to individual customer requirements.
- Contact your sales representative for details.

### USER ADJUSTABLE CONTROLS AND ADJUSTMENTS

- Brightness, Contrast, Horizontal Hold, Horizontal Size, Horizontal Raster Position, Horizontal Video Position, Vertical Hold, Vertical Size, Vertical Raster Position, Focus Custom Control Location available.

### POWER INPUT

- 120 VAC  $\pm 10\%$  -15%, 50-60 Hz, 85W (max). Isolation transformer required; furnished with monitor as an option.

### ENVIRONMENTAL CONDITIONS

- Operating temperature 0° to 55°C. Complies with U.L., C.S.A., and D.H.H.S. radiation performance standard (composite video).

### RESOLUTIONS

- | • Standard CRT             | • Fine Pitch CRT       |
|----------------------------|------------------------|
| 9" 280 Pixels x 240 Lines  | 410 Pixels x 240 Lines |
| 13" 400 Pixels x 240 Lines | 640 Pixels x 240 Lines |
| 19" 400 Pixels x 240 Lines | 640 Pixels x 240 Lines |
| 25" 560 Pixels x 240 Lines | N. A.                  |

**WARNINGS****1. Power Up Warning-**

An isolation transformer must be used between the AC supply and the AC plug of the monitor before servicing, testing, or operating the monitor since the chassis and the heat sink are directly connected to one side of the AC line which could present a shock hazard.

Before servicing is performed, read all the precautions labelled on the CRT and chassis.

**2. X-RAY RADIATION WARNING NOTICE**

**WARNING :** PARTS WHICH INFLUENCE X-RAY RADIATION IN HORIZONTAL DEFLECTION, HIGH VOLTAGE CIRCUITS AND PICTURE TUBE ETC. ARE INDICATED BY (★) IN THE PARTS LIST FOR REPLACEMENT PURPOSES. USE ONLY THE TYPE SHOWN IN THE PARTS LIST.

**3. High Voltage-**

This monitor contains HIGH VOLTAGES derived from power supplies capable of delivering LETHAL quantities of energy. Do not attempt to service until all precautions necessary for working on HIGH VOLTAGE equipment have been observed.

**4. CRT Handling-**

Care must be taken not to bump or scratch the picture tube as this may cause the picture tube to implode resulting in personal injury. Shatter proof goggles must be worn when handling the CRT. High voltage must be completely discharged before handling. Do not handle the CRT by the neck.

**5. PRODUCT SAFETY NOTICE**

**WARNING :** FOR "CONTINUED SAFE" REPLACE SAFEN CRITICAL COMPONENTS ONLY WITH MANUFACTURER RECOMMENDED PARTS THESE PARTS ARE IDENTIFIED BY SHADING AND BY (Δ) ON THE SCHEMATIC DIAGRAM.

**AVERTISSEMENT:** POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

For replacement purposes, use the same type or specified type of wire and cable, assuring the positioning of the wires is followed (especially for H.V. and power supply circuits). Use of alternative wiring or positioning could result in damage to the monitor or in a shock or fire hazard.

**AC CONNECTORS AND TERMINALS****ALL MONITORS EXCEPT THOSE WITH MODEL NUMBERS ENDING WITH 2 OR 6:****WELLS-GARDNER END**

	W.G Part No	Molex Part No
Plug	6A0396-001	19-09-2029
Pins Male	30x0759-003	02-09-2101

**USERS' END**

Receptacle	19-09-1029
Pins, Female	02-09-1101*
	or 02-09-1116*

**MODEL NUMBERS ENDING WITH 2:****WELLS-GARDNER END**

	W.G Part No	Molex Part No
Plug	6A0376-002	03-09-2022
Pins, Male	30X0759-001	02-09-2101

**USERS' END**

Receptacle	03-09-1022
Pins, Female	02-09-1101*
	or 02-09-1116*

**MODEL NUMBERS ENDING WITH 6:****WELLS-GARDNER END**

	W.G Part No	AMP Part No
Receptacle	6A0402-001	350778-I
Pins, Male	30X0761-001	350538-I

**USERS' END**

Plug	350777-I
Pins, Female	350537-I **
	or 350851-I **

\*-1101 is used for 20-14 AWG wire and insulation diameter range 0.065"-0.160"

1116 is used for 22-18 AWG wire and insulation diameter range 0.060"-0.120"

\*\* 350537-I is used for 20-14 AWG wire and insulation diameter range 0.130"-0.200"

350851-I is used for 24-18 AWG wire and insulation diameter range 0.040"-0.100"

# 1. BRIGHTNESS CONTROL VR6

This control has been preset at the factory. However, when the video signal is applied to the monitor, a slight adjustment may be desired. Adjust this control such that the illumination is just barely extinguished from portions of the display which should be black.

# 2. CONTRAST CONTROL VR7

Adjust the contrast control for the desired picture intensity.

# 3. FOCUS CONTROL

Adjust the focus control, located on the high voltage unit (T1), for maximum overall definition and fine picture detail.

# 4. HORIZONTAL HOLD CONTROL VR2

With the monitor being driven with the display signal, connect one jumper between TP1 and TP2 and another jumper between TP3 and TP4. Adjust the horizontal hold control until the picture stops sliding horizontally. Remove the jumpers. Do not use the horizontal hold control for horizontal centering. (See #5)

NOTE: If the sync signal is composite, use the horizontal sync input of the same polarity as the composite sync signal.

# 5. HORIZONTAL VIDEO SHIFT CONTROL VR1

Use this control to center the picture horizontally.

# 6. HORIZONTAL RASTER POSITION ADJUSTMENT

If the picture is off center horizontally (long dimension of picture tube), some compensation can be made by moving the horizontal raster position adjustment jumper either to positions "R" or "L".

# 7. HORIZONTAL SIZE COIL L1

The horizontal size coil is a hexagonal tuning tool adjustment. This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct horizontal proportions.

# 8. VERTICAL HOLD CONTROL VR5

Adjust this control until the picture stops rolling and it locks in vertically.

# 9. 50-60 Hz CONTROL VR9

This control is used to limit the range of vertical size. This control is preset at the factory and should not require readjustment unless the vertical size control or vertical hold control are readjusted from their original factory settings. In order to set this control, first adjust the vertical size control so that the picture is slightly larger than desired. Turn VR9 so that any vertical foldover which may be present will disappear. If the monitor is to be operated alternately at more than one vertical frequency, then perform this adjustment at the higher frequency.

# 10. VERTICAL SIZE CONTROL

This control must be adjusted slowly, if necessary, until the picture or test pattern attains the correct vertical proportions.

# 11. VERTICAL RASTER POSITION CONTROL VR3

If the video is off center vertically, (short dimension of picture tube) some compensation can be made by turning the vertical raster position control.

# 12. CUT OFF AND DRIVE CONTROLS ON NECK BOARD VR201, VR202, VR203, VR204, VR205, VR206.

These controls have been preset at the proper gray scale. Before adjusting any of these controls, refer to Troubleshooting Note 4 and to the White Balance procedure.

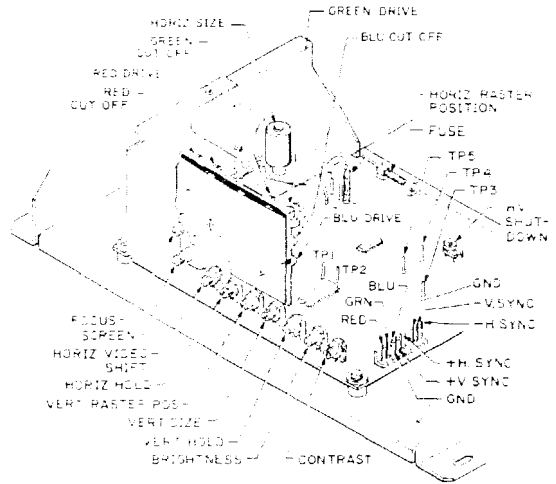


FIG. 1A

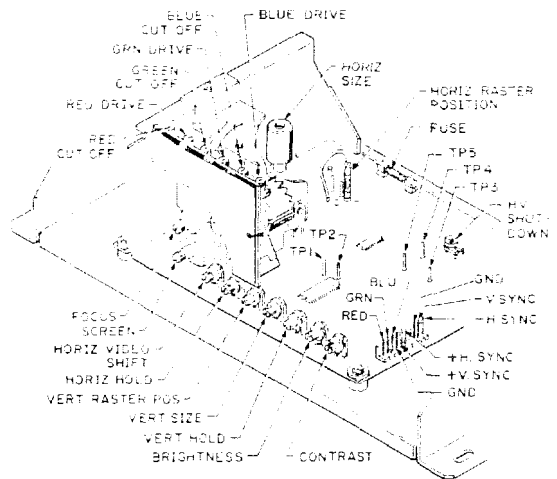


FIG. 1B

# INSTALLATION AND SERVICE INSTRUCTIONS

### NOTE:

All of the following procedures have been performed at the factory and should require no further attention. If the monitor is serviced for any reason, it should be observed afterward to determine whether any of these procedures need to be performed again.

### OUTLINE OF CONVERGENCE AND SET-UP PROCEDURE

**DEGAUSSING:** Demagnetize the shadow mask and all surrounding metal parts with an external degaussing coil.

**PURITY:** Adjust the purity magnets and the yoke position.

**STATIC CONVERGENCE:** Converge Red and Blue on Green in the center of the screen.

**DYNAMIC CONVERGENCE:** Converge Red and Blue at the edges of the screen.

**WHITE BALANCE:** Set Gray and White brightness tracking.

**NOTE:** Purity and convergence adjustment interant.

### DEGAUSSING

The monitor is equipped with an automatic degaussing circuit. However, if the CRT shadow mask has become excessively magnetized, it may be necessary to degauss it with a manual coil. Do not switch the coil OFF while the raster shows any effect from the coil.

### COLOR PURITY ADJUSTMENT

1 For best results, it is recommended that the purity adjustment be made in the final monitor location. If the monitor will be moved, perform this adjustment with it facing west or east. The monitor must have been operating 15 minutes prior to this procedure.

2 On picture tubes with a 22.5 mm neck diameter, set the ring assembly on the CRT neck with the center line of the purity ring-pair over the gap between grids No. 5 and 6. See Fig. 2A. [For picture tubes with a 29 mm neck, use the gap between grids No. 3 and 4. See Fig. 2B.]

3 Make certain that the magnetic ring-pairs are in their correct starting positions before beginning this procedure. The correct starting position for the purity ring-pair is not necessarily the one shown in Figure 2. The correct starting position will vary from ring assemblies from one manufacturer to another. It will be necessary to determine the correct starting position—also known as the zero correction position.

Figure 2 shows a ring assembly in which each of the rings of the purity ring pair has two tabs—one long and one short. With some ring assemblies of this type, the zero correction position is with the long tab of one ring aligned with the short tab of the other ring. On other ring assemblies of this type, the zero correction position is with the long tab of one ring aligned with the long tab of the other ring. The way to determine which is which is by trying one of these orientations and then rotating the two rings together as a pair without changing their orientation with respect to each other. If this rotation of the ring-pair causes no change in the purity, then it is the zero correction position. If the purity does change, then try the other orientation.

A third type of ring assembly has only one tab on each of the two purity rings. The zero correction position for this type of assembly is with the tabs of the two purity rings aligned with each other and pointing up toward the anode contact of the CRT.

The correct starting positions for the other ring pairs are as shown in Figure 2. For the other type of ring assembly (not shown), the correct starting position for the other two ring pairs is with all of the tabs aligned with each other and pointing up toward the anode contact of the CRT.

- Vertical raster position control must be at the center of its rotation.
- Remove the R-G-B signal from the monitor.
- Turn the Green Cut-off Control (VR203) on the Neck Board fully CW. (See Fig. 1).
- Turn the Red and Blue Cut-off Controls (VR201 & VR205) fully CCW.
- Pull the Deflection Yoke backward so that the Green belt loop appears. (See Fig. 4).

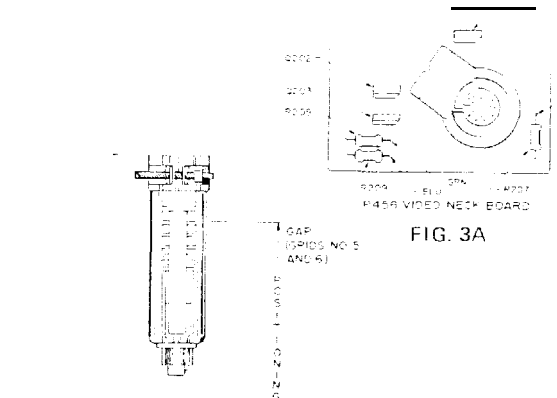


FIG. 3A

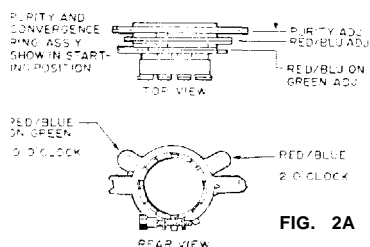


FIG. 2A

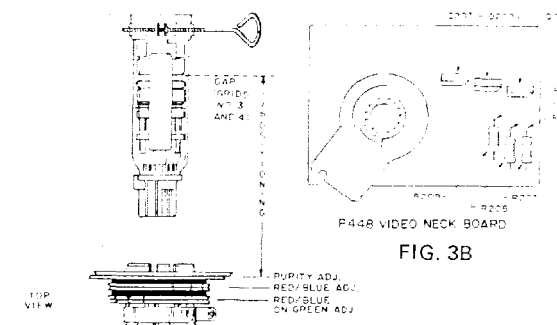


FIG. 3B

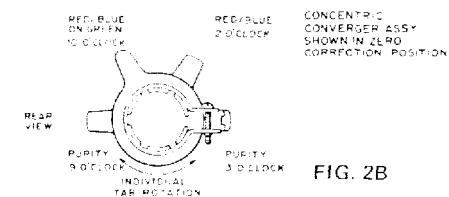


FIG. 2B

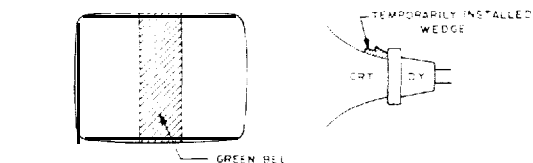
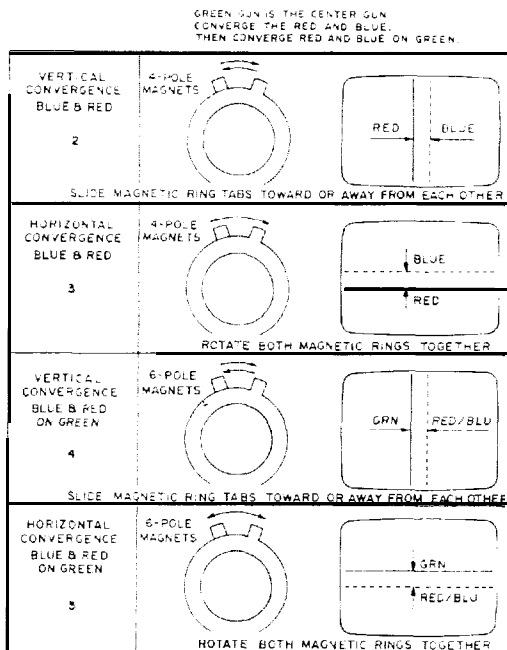


FIG. 4

- 9 Decrease the horizontal width of the raster, if necessary, in order to be able to see the right and left edges of the raster.
- 10 Move the two Purity Magnets with respect to each other in order to center the Green beam on the raster horizontally.
- 11 Push the Deflection Yoke forward gradually and fix it at the place where the Green screen becomes uniform throughout.
- 12 Turn the cut off and Drive Controls and confirm that each color is uniform.
- 13 If the color is not uniform, re-adjust it, moving the Purity Magnets slightly.
- 14 Turn all three cut off controls fully counterclockwise (CCW). Slowly turn up (CW) the Red cutoff control until a Red raster is just barely visible.
- 15 Slowly turn up the Green and Blue cutoff controls such that their associated colors, mixing with the Red, results in a White or Gray raster.
- 16 Confirm that the white or gray color is uniform throughout the screen.
- 17 Insert a wedge temporarily as shown in Fig. 4 and adjust the angle of the Deflection Yoke.

### STATIC CONVERGENCE ADJUSTMENT

- 4 Pole Magnets and 6 Pole Magnets are for static convergence
- 1 A cross hatch signal should be connected to the monitor.
- 2 A pair of 4-Pole Convergence Magnets is provided and adjusted to converge the blue and red beams (See Fig. 6). When the Pole opens to the left and right 45° symmetrically, the magnetic field maximizes. Red and blue beams move to the left and right (See Fig. 5). Variation of the angle between the tabs adjusts the convergence of red and blue vertical lines.
- 3 When both 4-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of the red and blue horizontal lines is adjusted.
- 4 A pair of 6-Pole Convergence Magnets is also provided and adjusted to converge the magenta (red + blue) to green beams (See Fig. 6). When the Pole opens to the left and right 30° symmetrically, the magnetic field is maximized. Red and blue beams both move to the left and right (See Fig. 5). Variation of the opening angle adjusts the convergence of magenta to green vertical lines.
- 5 When both 6-Pole Convergence Magnet Tabs are rotated as a pair, the convergence of magenta to green horizontal lines is adjusted.



REPEAT 3, 2 & 3 IF ALL LINES ARE NOT CONVERGED AT CENTER

FIG. 5

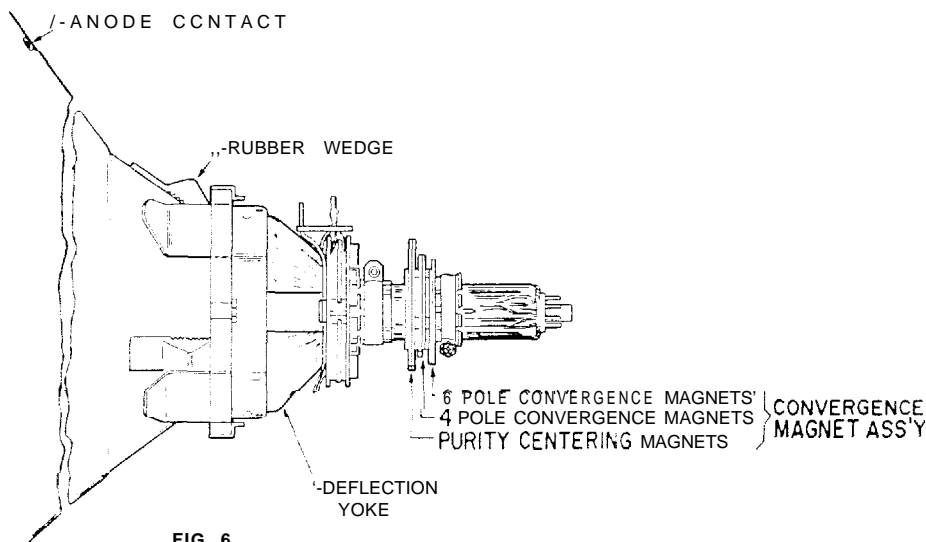


FIG. 6



## PRECISE ADJUSTMENT OF DYNAMIC CONVERGENCE

- 1) Feed a cross hatch signal to the monitor
- 2) Insert wedge temporarily and fix the Deflection Yoke so as to obtain the best circumference convergence (See Fig. 8 and 9)

NOTE:

The wedges may need to be moved during adjustments

- 3) Insert three rubber wedges to the position as shown in NOTE

- 1) Tilting the angle of the yoke up and down adjusts the crossover of both vertical and horizontal red and blue lines. See Fig 8 (a) and (b)
- 2) Tilting the angle of the yoke sideways adjusts the parallel convergence of both horizontal and vertical lines at the edges of the screen. See Fig 9 (a) and (b)
- 3) Use three rubber wedges (tapered rubber wedges are used for a purpose).
- 4) The position of each rubber wedge is shown in Fig 7.
- 5) Do NOT force the permanent wedges in. They are to be inserted until they just make contact with the yoke-after the yoke has been positioned.
- 6) Fix the three permanent rubber wedges with chloroprene rubber adhesive.
- 7) After the adhesive has dried enough to hold the wedges in place carefully remove the temporarily installed wedge.

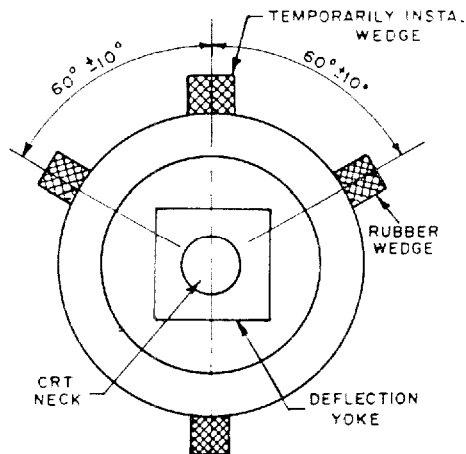
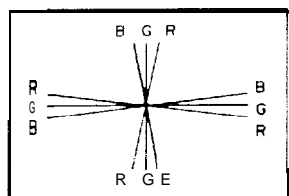
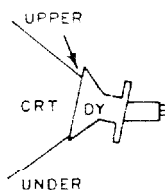


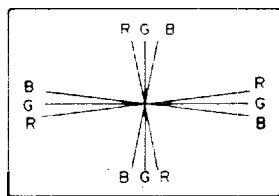
FIG. 7



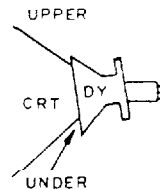
CRT SCREEN (a)



INSERT RUBBER WEDGE FROM UPPER SIDE

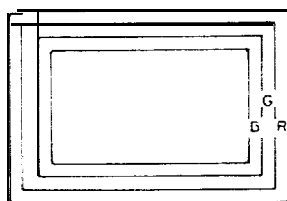


CRT SCREEN (b)

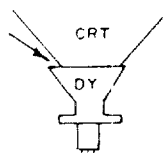


INSERT RUBBER WEDGE FROM LOWER SIDE

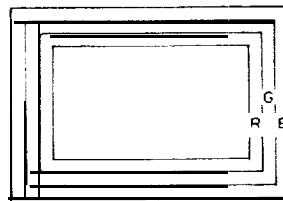
FIG. 8



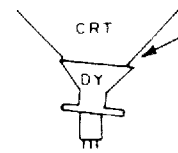
CRT SCREEN (a)



INSERT RUBBER WEDGE FROM LEFT SIDE



CRT SCREEN (b)

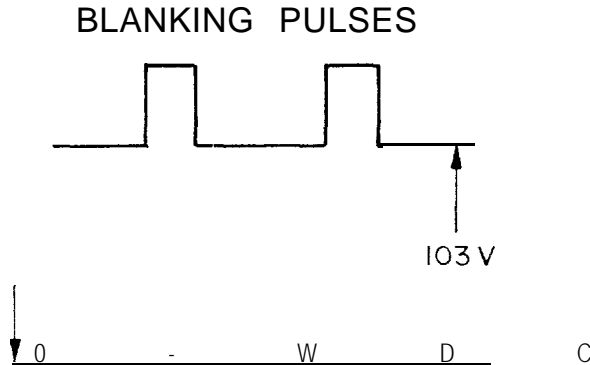


INSERT RUBBER WEDGE FROM RIGHT SIDE

FIG. 9

## WHITE BALANCE

- 1 Equipment Required An oscilloscope with a DC coupled mode in the vertical amplifier
- 2 Referring to Fig 1 and 3, do the following adjustments in subdued light after degaussing and setting the purity of the CKT
- 3 Ground the R/G/B video inputs Apply sync signals to the sync inputs
- 4 Set all three drive controls, VR202, VR204 & VR206, to their midpoints of rotation
- 5 Set the screen and R/G/B cutoff controls to their minimum (fully CCW) positions.
- 6 Connect the oscilloscope to the collector of a video output transistor Q201, Q202, or Q203 or to the end of R207, R208, or R209 indicated on Figure 3 as Red, Green Or Blue
- 7 If this white balance procedure is required because the CRT or neck board was replaced, then leave the contrast control at its original setting if the contrast control is known to be grossly out of adjustment, then set it to its center of rotation Adjust the brightness control VR6 to obtain the waveform shown in Figure 10 Now remove the scope probe
- 8 Slowly turn the screen control CW until the raster is just visible. The color of this raster is called the lead color gun. DO NOT adjust its associated cutoff control. It must remain fully CCW.
- 9 Adjust the screen control CCW until the raster is just extinguished
- 10 Adjust the brightness control for a dim raster Adjust the two remaining cutoff controls (NOT the lead color gun cutoff control) for best gray uniformity.
- 11 Adjust the brightness control for a bright raster but not maximum brightness Adjust the R/G drive controls, if necessary for best neutral white Try not to adjust the blue drive control
- 12 Repeat steps 13 and 11 until good tracking of white balance is achieved End with step 10
- 13 With the oscilloscope connected to the collector or the lead color video output transistor (See Fig. 3), adjust the brightness control to obtain the waveform in Fig 10



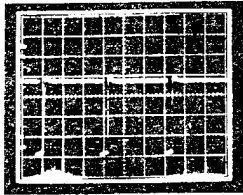
**FIG. 10**

## TYPICAL OSCILLOSCOPE WAVEFORM PATTERNS

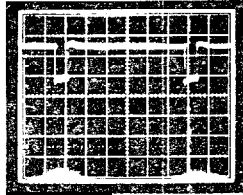
The waveforms shown below were observed on a wide band oscilloscope. The input signal was from a crosshatch generator with a horizontal sync frequency of 15.73-KHz and a vertical frequency of 60-Hz. If the waveforms are observed on an oscilloscope with a limited high frequency response, the corners of the pulses will tend to be more rounded than those shown and the amplitude of any high frequency pulse will tend to be less.

Each photograph is numbered. These numbers correspond to the circled numbers on the schematic diagrams.

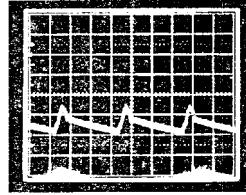
Photographs 12, 13, 14, 15 and 16 are of the red signal at various points along the red video channel. The waveforms at corresponding points along the green and blue video channels will look similar.



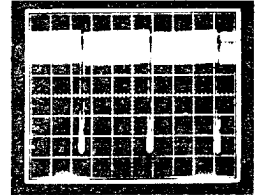
2V/DIV 20  $\mu$ SEC/DIV



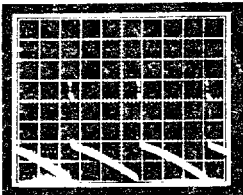
2V/DIV 10  $\mu$ SEC/DIV



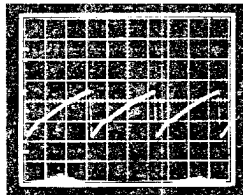
0.5V/DIV 20  $\mu$ SEC/DIV



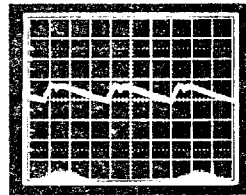
0.2V/DIV 5MSEC/DIV



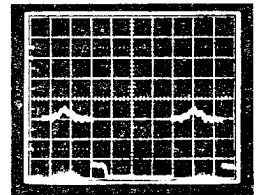
10V/DIV 5MSEC/DIV



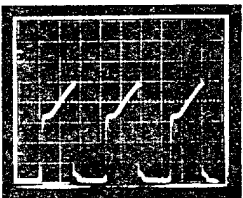
2V/DIV 20  $\mu$ SEC/DIV



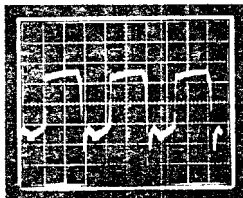
1V/DIV 20  $\mu$ SEC/DIV



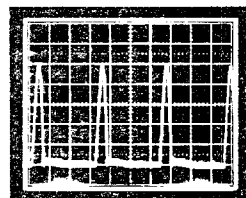
0.5V/DIV 10  $\mu$ SEC/DIV



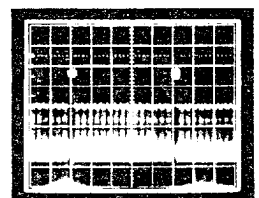
20V/DIV 20  $\mu$ SEC/DIV



0.5V/DIV 20  $\mu$ SEC/DIV



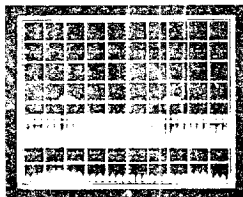
5V/DIV 20  $\mu$ SEC/DIV



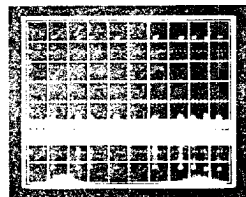
1V/DIV 0.2MSEC/DIV



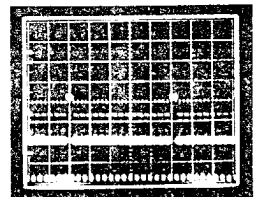
1V/DIV 0.2MSEC/DIV



1V/DIV 0.2MSEC/DIV



2V/DIV 0.2MSEC/DIV



1V/DIV 0.2MSEC/DIV

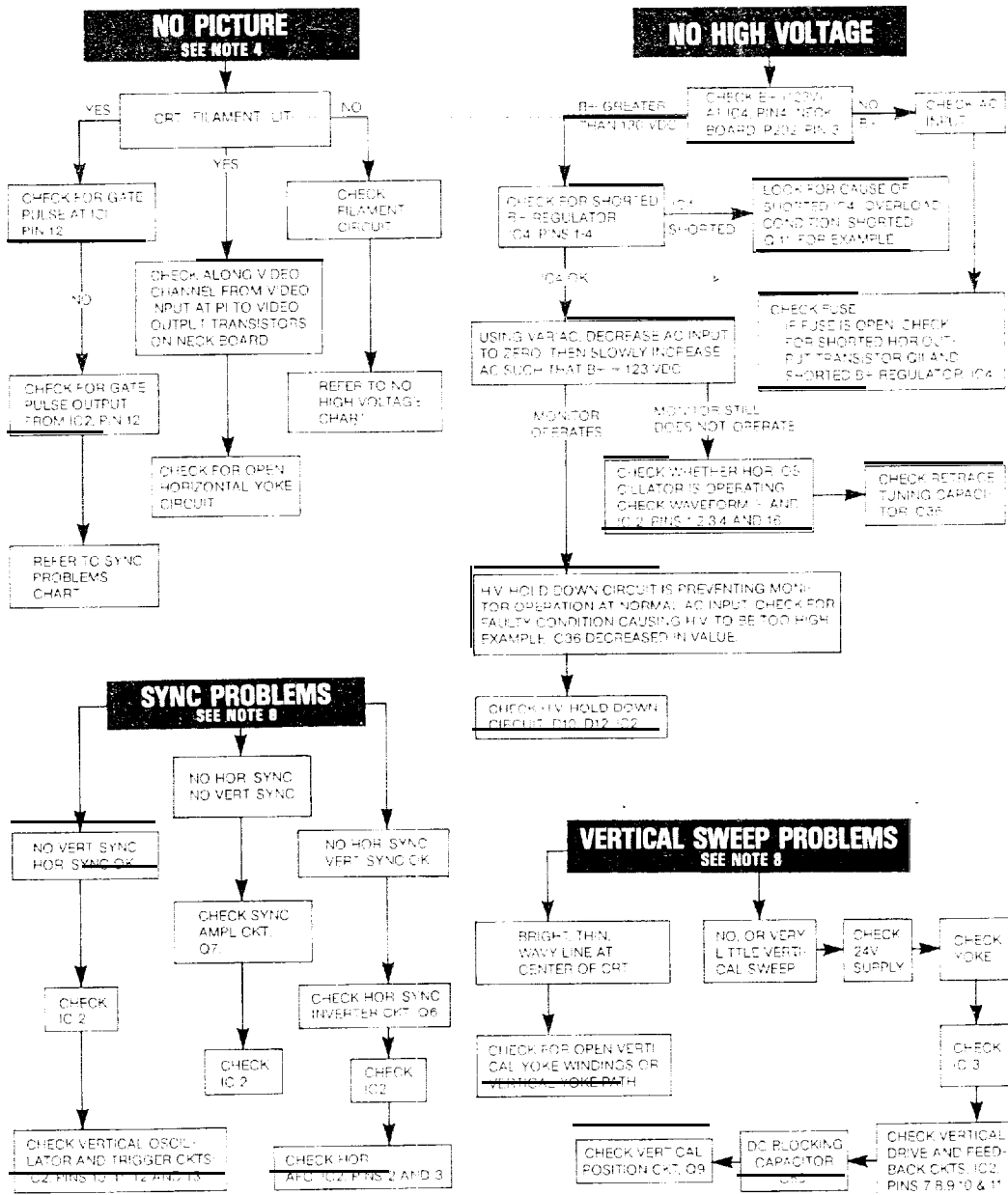
## TROUBLESHOOTING NOTES

- 1 The troubleshooting chart mentions specific components to be checked. It is intended that the entire circuit associated with these components be checked.
- 2 This chart is a guide to servicing rather than a complete list of each component that could fail. Therefore, troubleshooting should not be limited only to those components mentioned in the chart.
- 3 It is always useful to begin checking a circuit by measuring the DC voltages and then comparing the measurements to those listed in the Typical DC Voltages chart.
- 4 The cutoff controls and drive controls on the neck board and the screen control at the bottom of the flyback transformer have been preset at the factory. When servicing the monitor for a lack of video, do not adjust any of these controls unless it is suspected that the problem is a result of these controls having been tampered with. Otherwise do not adjust these controls; if they are so severely out of adjustment that there is a lack of video, then there is something malfunctioning.
- 5 The Wells-Gardner Service Department does accept telephone calls for servicing assistance. Call 1-312-252-8220, between 7:00am and 3:30pm Central Time. Ask for the Service Department. The Service Department is closed during the first two weeks of July. Telephone assistance is not available during this period. Before calling, be sure to have available the model number of the monitor being serviced and the schematic diagram of the monitor being serviced.
- 6 Replacement parts may be ordered from the Service Department between 7:00am and 4:30pm Central Time.
- 7 All monitors are equipped with automatic degaussing coils which demagnetize the picture tube every time the monitor is turned on after being off for a minimum of 20 minutes. Should any part of the chassis become magnetized it will be necessary to degauss the affected area with a manual degaussing coil. Move the coil slowly around the CRT face area and all surrounding metal parts. Then slowly withdraw for a distance of 6 feet before turning off.
8. Horizontal vs. Vertical:

Some models have the picture tube mounted vertically rather than horizontally. That is, the picture tube is mounted in the frame such that the long dimension of the tube is up and down. Examples of this include (but are not limited to) Models 13K7851 and 19K7951. Other than the physical orientation of the picture tube, there is no electrical difference between these models and their horizontal counterparts. The same circuits, the vertical circuits, produce and control deflection along the short dimension of the tube in all models.

The same circuits, the horizontal circuits, produce and control deflection along the long dimension of the tube in all models. Therefore, wherever "vertical" appears in this manual or on the monitor, it refers to the short dimension of the picture tube. wherever "horizontal" appears, it refers to the long dimension of the picture tube.

## TROUBLESHOOTING CHART



## VIDEO INTERFACE AND OUTPUT

The red, green, and blue video inputs come into the monitor at P1. Isolation and attenuation is provided by emitter followers Q1, Q2 and Q3. Forced blanking of the video signals is provided by the circuit of Q4, D5, D6, and D7. The forced blanking causes there to be an interruption in the video signal before it goes to the inputs of IC1. This interrupt on occurs between scan periods, while retrace is taking place; it is required by IC1. The forced blanking is not necessary for most video signals since they already have an interruption of video (blanking) between scan periods. Some do not; it is to accommodate such signals that the forced blanking circuit is included.

The red, green, and blue signals go into IC1 at pins 2, 4, and 6. Their levels are controlled by the gain of separate channels of the contrast amplifier. The gain is controlled by a DC voltage input to pin 11, which varies with the setting of the contrast control.

IC1 provides blanking of the video during retrace in response to blanking pulses at pin 13, derived from the horizontal and vertical sweep circuits. IC1 also requires a gating signal at pin 12 in order to provide red, green, and blue outputs at pins 21, 19, and 17. If the gating signal is not present, IC1 will not provide video output signals. The gating signal comes from IC2, pin 12 and is derived from horizontal sync.

The brightness is varied by varying the DC level of the outputs at pins 17, 19, and 21. This is accomplished by varying the DC voltage input to pin 14.

The video outputs from IC1 are provided via R30, R31, and R32 to the neck board where they are amplified by the video output stages Q201, Q202, and Q203 before being applied to the cathodes of the CRT through R10, R11, and R12.

## SYNC

Sync is applied at P1 (positive sync) or at P2 (negative sync). Composite sync should be applied only to the horizontal sync input of the appropriate polarity. Positive sync is inverted by Q5 and Q6 then applied through D3, D4 and R51 to the sync amplifier Q7.

The sync amplifier output is applied through C22, R53, and R55 to pin 14 of IC2. Pin 14 is the sync separation input.

The sync separator extracts the horizontal and vertical sync from each other, providing horizontal sync to the horizontal AFC circuit in the IC. A composite sync output is provided at pin 12. This output signal is used for gating IC1 the video interface IC and for triggering the vertical oscillator.

## HORIZONTAL OSCILLATOR AND OUTPUT

The horizontal AFC circuit of IC2 receives a horizontal sync input from the sync separator and a feedback signal at pin 1, derived from the horizontal output. Slight differences in frequency and phase of the two signals will cause the AFC to generate a correction voltage at pin 2.

The horizontal oscillator in IC2 has its free running frequency determined by the RC time constant of C19, R56, R57, R58 and VR2, the horizontal hold control. The horizontal hold control varies the horizontal frequency by varying the RC time constant. Slight correction in frequency is provided by a correction voltage at IC2, pin 3 which comes from pin 2 through R60.

The oscillator output at pin 4 is amplified and shaped by the horizontal drive stage Q10. The drive signal is then coupled to the base circuit of the horizontal output transistor Q11 by the horizontal drive transformer T2. T2 is used for impedance transformation to provide the Q11 base circuit with the low impedance source that it requires.

The horizontal output transistor Q11 is operated as a switch. It is either on or off. It is turned on and off at the scan rate which is determined by the horizontal oscillator frequency, which is ultimately determined by the incoming horizontal sync frequency. A yoke current with a sawtooth waveform is needed to deflect the beam linearly across the CRT. The beam begins at the center of the CRT and is deflected from center to right. This center-to-right deflection occurs when Q11 is turned on. The deflection yoke coupling capacitor C38, also known as the S-shaping capacitor, begins to discharge through the yoke; the discharge current causes the beam to be deflected to the right CRT edge. At this time, Q11 is turned off, and the current provided by C38 stops. As the current falls to zero, a voltage is induced across the yoke windings as the magnetic field collapses; an oscillation is produced by the yoke windings and C36, the retrace tuning capacitor. During the first half cycle of oscillation, the induced voltage is impressed on the collector of Q11, C36, and the primary of the flyback transformer T1. This induced voltage is stepped up by the flyback transformer's secondary winding. This high voltage is then rectified and applied to the high voltage anode of the CRT. When this induced voltage occurs, the electron beam is deflected from the right edge of the CRT face to the left edge. This is called retrace. During the second half cycle of the oscillation (of C36 and the yoke windings), the voltage at the Q11 collector tries to go negative or below ground. When this happens, the damper diode (include in same package with Q11) becomes forward biased. The conduction of the damper diode allows energy stored in the horizontal system to decay linearly to zero, thus allowing the beam to return to the center of the CRT face.

The focus voltage and the screen, G2, voltage are obtained from the anode voltage with a resistor divider network within the T1 assembly. An auxiliary winding (pin 10) provides feedback to the horizontal AFC through R71, R70 and C29. This signal is also used to furnish the horizontal blanking input to IC1 via C28, R69, and R68. The signal from the auxiliary winding at pin 5 of T1 is rectified by D14 and filtered to provide the +12VDC supply for the video interface and sync circuits. The auxiliary winding of pins 3 and 4 produces a signal which is rectified by D13 and filtered to produce the +24VDC supply for the vertical output circuit.

The horizontal linearity coil L2 is a magnetically biased coil which shapes the yoke current for optimum linearity. The horizontal size coil L1 is a variable series inductor which is used to vary the horizontal size of the display.

#### HIGH VOLTAGE HOLD-DOWN CIRCUIT

The high voltage hold down circuit is part of the main PC board P447 of this monitor. The +12V DC supply is sensed via D10. Since the +12V DC supply is flyback pulse derived, the +12V DC supply will rise as the high voltage rises. If the +12V DC exceeds a threshold which is set with VR8, then D12 will conduct, thereby providing drive to IC2, pin 5—hold-down input of deflection oscillator IC. The drive being applied to pin 5 causes the horizontal oscillator within the IC to shut down—thus preventing the generation of high voltage.

The horizontal oscillator will remain in its OFF state, even if the input to IC2, pin 5 is removed, unless and until AC power is removed from the monitor input. The power may then be reapplied.

#### VERTICAL OSCILLATOR AND OUTPUT

The composite sync output of IC2, pin 12 is filtered through the network of R65, C25, C24 and R66 so that only vertical sync is applied to the vertical trigger input at pin 11. The vertical oscillator frequency is controlled by the vertical hold control and its input to pin 10.

The vertical drive output at IC2, pin 7 is applied to pin 4 of IC3, the vertical output IC. Output current from IC3, pin 2 flows through the yoke to cause vertical deflection. During upward deflection, current flows out of pin 2, through the yoke, and into C50 to charge it. Downward deflection is caused by C50 discharging through the yoke in the opposite direction and back into IC3, pin 2. AC feedback is provided through the wiper of the vertical size control VR4 to IC2, pin 8 in order to control the drive amplitude. DC feedback at IC2, pin 9 maintains good vertical linearity at all sizes.

DC current from the +24V supply flows through R83 and through the yoke to provide downward raster shift. Some of this DC current is diverted from the yoke through the collector of Q9. The amount of this current which is diverted from the yoke can be varied by varying the base drive to Q9 by adjusting VR3, the vertical position control, thus providing manual adjustment of the vertical position of the display.

The drive signal at IC3, pin 2 is also used to furnish the vertical blanking input to IC1, pin 13 via R63 and C14.

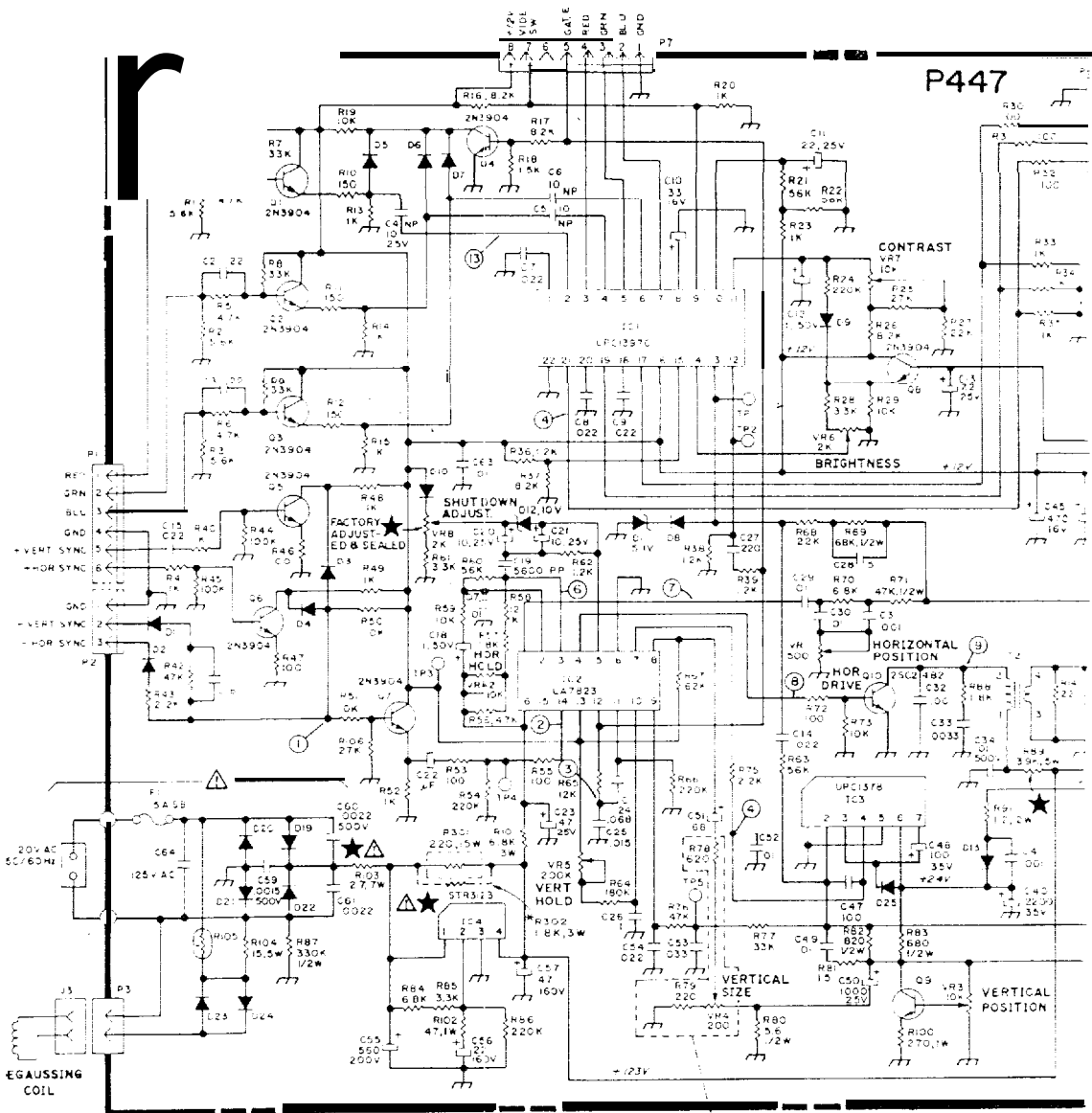
#### AUTOMATIC DEGAUSSING ADG

The ADG circuit automatically demagnetizes the CRT. This circuit is activated only when the monitor is initially powered up after having been off for at least 20 minutes.

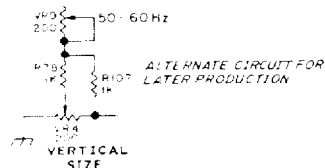
R105 is a positive temperature coefficient device. When it is cold, it has a very low resistance. As it gets warm, its resistance increases. If the monitor is cold when AC power is applied, then R105 with a low resistance allows current to pass through it, D23, D24, and the degaussing coil. As current flows through R105, it heats up and eventually has a very high resistance, allowing very little current to flow through it. The residual current now flowing through R105 produces a voltage drop across R104 of less than 0.6 volts. This is not enough to forward bias D23 and D24, so there is no current through the degaussing coil.

The process of initially having a large current through the degaussing coil and then having the current decay to zero is what produces the degaussing action. The degaussing current decays to zero before the CRT warms up, so the degaussing is completed before the picture comes on.

# K7000 COLOR MONITOR SCHEMATIC DIAGRAM



\*R302 IS PRESENT ONLY ON  
9K7600 AND 19K7900 SE-  
RIES MONITORS








# GENERAL REPLACEMENT PARTS LIST

For all K7000 models except where noted.

This monitor contains circuits and components included specifically for safety purposes.

For continued protection no changes should be made to the original design, and components shown in shaded areas of schematic, or  on parts list should be replaced with exact factory replacement parts.

The use of substitute parts may create a shock, fire, radiation or other hazard. Service should be performed by qualified personnel only.

## P447 MAIN BOARD

Ref. No	Part No	Description	Ref. No	Part No	Description
<b>RESISTORS</b>			<b>RESISTORS (Cont.)</b>		
R1	340X2562-934	5.6K Ohm 5% 0.25W	R59	340X2103-934	10K Ohm 5% 0.25W
R2	340X2562-934	5.6K Ohm 5% 0.25W	R60	340X2563-934	56K Ohm 5% 0.25W
R3	340X2562-934	5.6K Ohm 5% 0.25W	R61	340X2332-934	3.3K Ohm 5% 0.25W
R4	340X2472-934	4.7K Ohm 5% 0.25W	R62	340X2122-934	1.2K Ohm 5% 0.25W
R5	340X2472-934	4.7K Ohm 5% 0.25W	R63	340X2563-934	56K Ohm 5% 0.25W
R6	340X2472-934	4.7K Ohm 5% 0.25W	R64	340X2184-934	180K Ohm 5% 0.25W
R7	340X2333-934	33K Ohm 5% 0.25	R65	340X2123-934	12K Ohm 5% 0.25W
R8	340X2333-934	33K Ohm 5% 0.25	R66	340X2224-934	220K Ohm 5% 0.25W
R9	340X2333-934	33K Ohm 5% 0.25	R67	340X2623-934	62K Ohm 5% 0.25W
R10	340X2151-934	150 Ohm 5% 0.25W	R68	340X2223-934	22K Ohm 5% 0.25W
R11	340X2151-934	150 Ohm 5% 0.25W	R69	340X3653-231	68K 5% 0.5W CAR
R12	340X2151-934	150 Ohm 5% 0.25W	R70	340X2682-934	6.8K Ohm 5% 0.25
R13	340X2102-934	10K Ohm 5% 0.25W	R71	340X3473-234	47K 5% 0.5W
R14	340X2102-934	10K Ohm 5% 0.25W	R72	340X2101-934	100 Ohm 5% 0.25W
R15	340X2102-934	10K Ohm 5% 0.25W	R73	340X2103-934	10K Ohm 5% 0.25W
R16	340X2822-934	8.2K Ohm 5% 0.25W	R74	340X2220-934	22 Ohm 5% 0.25W
R17	340X2822-934	8.2K Ohm 5% 0.25W	R75	340X2222-934	2.2K Ohm 5% 0.25W
R18	340X2152-934	1.5K Ohm 5% 0.25W	R76	340X2473-934	47K Ohm 5% 0.25W
R19	340X2103-934	10K Ohm 5% 0.25W	R77	340X2333-934	33K Ohm 5% 0.25
R20	340X2102-934	10K Ohm 5% 0.25W	R78	340X2102-934	10K Ohm 5% 0.25W
R21	340X2563-934	56K Ohm 5% 0.25W	R80	340X3056-934	5.6 5% 0.5W
R22	340X2562-934	5.6K Ohm 5% 0.25W	R81	340X2150-934	15 Ohm 5% 0.25W
R23	340X2102-934	10K Ohm 5% 0.25W	R82	340X3821-934	820 Ohm 5% 0.5W
R24	340X2224-934	220K Ohm 5% 0.25W	R83	340X3681-934	680 Ohm 5% 0.5W
R25	340X2273-934	27K Ohm 5% 0.25W	R84	340X2682-934	6.8K Ohm 5% 0.25
R26	340X2822-934	8.2K Ohm 5% 0.25W	R85	340X2332-934	3.3K Ohm 5% 0.25W
R27	340X2223-934	22K Ohm 5% 0.25W	R86	340X2224-934	220K Ohm 5% 0.25W
R28	340X2332-934	33K Ohm 5% 0.25W	R87	340X3334-844	330K 10% 0.5W
R29	340X2103-934	10K Ohm 5% 0.25W	R88	340X4182-633	1.8K 5% 1W
R30	340X2101-934	100 Ohm 5% 0.25W	★R89	043X0476-002	3.9K 5% 5W MO
R31	340X2101-934	100 Ohm 5% 0.25W	R90	043X0486-002	1.2 5% 2W MF
R32	340X2101-934	100 Ohm 5% 0.25W	R91	043X0486-002	1.2 5% 2W MF
R33	340X2102-934	10K Ohm 5% 0.25W	R92	043X0486-002	1.2 5% 2W MF
R34	340X2102-934	10K Ohm 5% 0.25W	R93	420X5102-324	10K 5% 2W
R35	340X2102-934	10K Ohm 5% 0.25W	R94	340X2473-934	47K Ohm 5% 0.25W
R36	340X2122-934	1.2K Ohm 5% 0.25W	R95	340X2473-934	47K Ohm 5% 0.25W
R37	340X2822-934	8.2K Ohm 5% 0.25W	R96	420X6182-325	1.8K Ohm 5% 3W WW
R38	340X2122-934	1.2K Ohm 5% 0.25W	R97	420X6271-325	270 5% 3W
R39	340X2122-934	1.2K Ohm 5% 0.25W	R98	340X4222-633	2.2K Ohm 5% 1W
R40	340X2102-934	10K Ohm 5% 0.25W	R99	340X4222-633	2.2K Ohm 5% 1W
R41	340X2102-934	10K Ohm 5% 0.25W	R100	340X4271-633	270 5% 1W
R42	340X2473-934	47K Ohm 5% 0.25W	R101	420X6682-325	6.8K 5% 3W
R43	340X2222-934	2.2K Ohm 5% 0.25W	R102	340X4470-633	47 5% 1W
R44	340X2104-934	100K Ohm 5% 0.25W	★R103	043X0483-001	2.7 Ohm 5% 7W
R45	340X2104-934	100K Ohm 5% 0.25W	R104	043X0484-001	15 Ohm 5% 5W
R46	340X2101-934	100 Ohm 5% 0.25W	R105	043X0485-001	Thermister
R47	340X2101-934	100 Ohm 5% 0.25W	R106	340X2273-934	27K Ohm 5% 0.25W
R48	340X2102-934	10K Ohm 5% 0.25W	R107	340X2102-934	10K Ohm 5% 0.25W
R49	340X2102-934	10K Ohm 5% 0.25W	R301	043X0481-003	220 Ohm 15W WW
R50	340X2103-934	10K Ohm 5% 0.25W	VR1	040X0653-002	CTRL 500
R51	340X2103-934	10K Ohm 5% 0.25W	VR2	040X0653-005	CTRL 10K
R52	340X2102-934	10K Ohm 5% 0.25W	VR3	040X0653-005	CTRL 10K
R53	340X2151-934	150 Ohm 5% 0.25W	VR4	040X0653-001	CTRL 200
R54	340X2224-934	220K Ohm 5% 0.25W	VR5	040X0653-006	CTRL 200K
R55	340X2101-934	100 Ohm 5% 0.25W	VR6	040X0653-003	CTRL 2K
R56	340X2472-934	4.7K Ohm 5% 0.25W	VR7	040X0653-005	CTRL 10K
R57	340X2132-934	1.8K Ohm 5% 0.25W	★VR8	040X0639-006	Trim Pot 2K Ohm 0.5W
R58	340X2123-934	1.2K Ohm 5% 0.25W	VR9	040X0655-001	Trim Pot 200 Ohm

# REPLACEMENT PARTS LIST

## P447 MAIN BOARD (CONT.)

Ref. No.	Part No.	Description
----------	----------	-------------

### CAPACITORS

C1	040X0099-671	Disc 22PF 10% NPO
C2	080X0099-671	Disc 22PF 10% NPO
C3	080X0099-671	Disc 22PF 10% NPO
C4	045X0577-501	Elect 10MF NP 25V
C5	045X0577-501	Elect 10MF NP 25V
C6	045X0577-501	Elect 10MF NP 25V
C7	047X0786-502	MYR 022 10% 50V
C8	047X0786-502	MYR 022 10% 50V
C9	047X0786-502	MYR 022 10% 50V
C10	045X0560-531	Elect 22MF 25V
C11	045X0560-534	LYT 1 00UF 50V
C12	045X0560-534	Elect 22MF 25V
C13	047X0786-502	MYR 022 10% 50V
C14	047X0786-502	MYR 022 10% 50V
C15	047X0786-502	MYR 022 10% 50V
C16	047X0786-511	MYR 1 10UF 50V
C17	047X0786-501	010UF 10% 50V P-Est
C18	045X0560-514	LYT 1 00UF 50V
C19	045X0560-502	PP 005F 20% AWS 50V
C20	045X0560-518	LYT 1 00UF 50V
C21	045X0560-518	LYT 1 00UF 50V
C22	045X0560-514	LYT 1 00UF 50V
C23	045X0560-517	LYT 47UF 10V
C24	047X0786-503	MYR 022 10% 50V
C25	047X0786-512	P-Ester 015 10% 50V
C26	047X0786-511	MYR 1 10UF 50V
C27	080X0099-657	Disc 22PF 10% Z5F
C28	080X0099-048	5PF 20% 25V NPO
C29	047X0786-501	010UF 10% 50V P-Est
C30	080X0099-505	Disc 30F 20% Z5F 500V
C31	047X0786-501	010UF 10% 50V P-Est
C32	080X0099-582	Disc 100 10% Z5F 500V
C33	080X0099-722	Disc 0033 10% Y5P 500V
C34	080X0099-221	Disc 01 10% Y5P 500V
C35	047X0786-501	010UF 10% 50V P-Est
★C36	046X0551-003	PP 6100 20% 1500V
C37	046X0544-005	1E 150V PP
★C38	046X0535-046	39UF 5% 200V PP
C39	046X0560-033	Elect 22 10 35V
C40	080X0099-505	Disc 30F 20% Z5F 500V
C41	045X0560-056	LYT 1 00UF 10V
C42	080X0099-505	Disc 30F 20% Z5F 500V
C43	046X0544-009	1 100 100V P-Est
C44	045X0560-020	LYT 470UF 16V
C45	045X0560-020	LYT 470UF 16V
C46	080X0099-580	Disc 10 10% Z5F 500V
C47	045X0560-532	Elect 10MF 35V
C48	047X0786-501	010UF 10% 50V P-Est
V49	045X0560-023	LYT 1000PF 25V
C50	045X0525-512	Tan 4F 10% 25V
C51	047X0786-501	010UF 10% 50V P-Est
C52	047X0786-514	033UF 5% 50V P-Est
C53	047X0786-514	MYR 022 5% 50V
C54	045X0578-001	Elect 560 200V
C55	045X0569-003	LYT 22UF 160V
C56	045X0569-011	Elect 47 160V
C57	080X0099-724	Disc 0015 10% Y5P 500V
C58	080X0099-723	Disc 0022 10% Y5P 500V
C59	080X0099-723	Disc 0022 10% Y5P 500V
C60	046X0552-001	1 20K 125VAC
C61	047X0786-501	010UF 10% 50V P-Est

Ref. No.	Part No.	Description
----------	----------	-------------

### SEMICONDUCTORS

D2	066X0070-001	Diode 1N914P
D3	066X0070-001	Diode 1N914P
D4	066X0070-001	Diode 1N914P
D5	066X0070-001	Diode 1N914P
D6	066X0070-001	Diode 1N914P
D7	066X0070-001	Diode 1N914P
D8	066X0070-001	Diode 1N914P
D9	066X0070-001	Diode 1N914P
D10	066X0070-001	Diode 1N914P
D11	066X0010-005	Zener Diode 5.1V 5% 0.5W
D12	066X0010-005	Zener Diode 16V 5% 0.5W
D13	066X0030-001	D1 Fast SW RJ-2
D14	066X0030-001	D1 Fast SW RJ-2
★D15	066X0030-001	D1 Fast SW RJ-2
D16	066X0030-001	D1 Fast SW RJ-2
D17	066X0030-001	D1 Fast SW RJ-2
D18	066X0084-001	Diode Sanyo 3F513R
D19	066X0091-001	Diode S1A 600V
D20	066X0091-001	Diode S1A 600V
D21	066X0091-001	Diode S1A 600V
D22	066X0091-001	Diode S1A 600V
D23	066X0091-001	Diode S1A 600V
D24	066X0091-001	Diode S1A 600V
D25	066X0099-001	D1 Boost
D1	066X0113-501	TRSTR NPN 2N3904
D2	066X0113-501	TRSTR NPN 2N3904
D3	066X0113-501	TRSTR NPN 2N3904
D4	066X0113-501	TRSTR NPN 2N3904
D5	066X0113-501	TRSTR NPN 2N3904
D6	066X0113-501	TRSTR NPN 2N3904
D7	066X0113-501	TRSTR NPN 2N3904
D8	066X0113-501	TRSTR NPN 2N3904
D9	066X0113-501	TRSTR NPN 2N3904
D10	066X0185-501	TRSTR NPN 2N3904
D11	066X0185-501	TRSTR 2SD1526
D12	066X0185-501	IC Video UPC1374 NEC
D13	066X0187-001	IC Horiz Verr LA823
D14	066X0189-001	IC Vert Output JRC1375
★D15	066X0189-001	Regulator 0.5A 5V 12V

### TRANSFORMERS AND COILS

★L1	009A2854-001	Coil Width 100A4
★L2	009A2855-001	Coil Lin 100A4
★L3	053X0528-001	Trans F. back
★L4	052X0131-001	Trans Horiz Driver

### MISCELLANEOUS

★F1	016X0176-001	Fuse 1.5A 5B
F2	016X0182-001	Fuse Clip
P1	006A0428-001	Plug Header
P2	006A0428-001	Plug Header
P3	006A0427-001	Plug 2 Pin
P4	006A0406-001	Plug 4 Pin QSHIMA
P5	006A0429-001	Plug Header
J202	013X1243-001	Cable Assy 4 Wire 35mm

△  
△  
△  
△

# REPLACEMENT PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
<b>P456 NECK BOARD (used with CRT's with a 22.5mm neck diameter)</b>					
<b>RESISTORS</b>			<b>CAPACITORS</b>		
R201	340X2272-934	Res 0.7K Ohm 5% 0.25W	Q201	080X0090-006	Cap 470PF 10% Z5F CER
R202	340X2151-934	Res 150 Ohm 5% 0.25W	Q202	080X0099-006	Cap 470PF 10% Z5F CER
R203	340X2272-934	Res 2.7K Ohm 5% 0.25W	Q203	080X0099-006	Cap 470PF 10% Z5F CER
R204	340X2151-934	Res 150 Ohm 5% 0.25W	Q204	080X0099-221	C Disc 01 10% Y5P 50C
R205	340X2272-934	Res 2.7K Ohm 5% 0.25W	Q205	080X0099-225	C Disc 0015 1.5Kv
R206	340X2151-934	Res 150 Ohm 5% 0.25W			
R207	340X5082-633	Res 68K 2W MO	<b>SEMICONDUCTORS</b>		
R208	340X5082-633	Res 68K 2W MO	Q201	086X0184-001	TRSTR 2SC2068LB/LB5K
R209	340X5082-633	Res 68K 2W MO	Q202	086X0184-001	TRSTR 2SC2068LB/LB5K
R210	340X3272-244	Res 2.7K Ohm 10% 0.5W	Q203	086X0184-001	TRSTR 2SC2068LB/LB5K
R211	340X3272-244	Res 2.7K Ohm 10% 0.5W			
R212	340X3272-244	Res 2.7K Ohm 10% 0.5W			
R213	340X5089-030	Res 66 Ohm 5% 2W			
VR201	040X0653-003	CTRL 2K	<b>MISCELLANEOUS</b>		
VR202	040X0653-001	CTRL 200	P202	006A0429-005	Plug Header
VR203	040X0653-003	CTRL 2K	SKT201	003A0638-001	Pix Socket
VR204	040X0653-001	CTRL 200	JB	013X1243-001	Cable Assy 4 Wire 550um
VR205	040X0653-003	CTRL 2K		030X0737-001	Plug V Pin
VR206	040X0653-001	CTRL 200			

## P448 NECK BOARD (Used with CRT's with a 29mm neck diameter)

Same as PC56 NECK BOARD except:

SKT201 003A065 001 SOC CRT

## FINAL ASSEMBLY PARTS

Ref. No.	Part No.	Description
<b>9K7700 SERIES (9")</b>		
△ *	88X0218-506	CRT Toshiba A230AN99X
★	9A2865-001	Deflection Yoke
	2A0690-001	Purity & Convergence Ring Assembly
	9A2854-001	Degaussing Coil Assembly
	8X0378-001	Rubber Wedge
<b>13K7800 SERIES (13")</b>		
△ *	88X0236-506	CRT Orion A34JLL00X
★	9A2860-001	Deflection Yoke
	2A0690-001	Purity & Convergence Ring Assembly
	9A2858-001	Degaussing Coil Assembly
	8X0378-001	Rubber Wedge
<b>19K7600 and 19K7900 SERIES (19")</b>		
△ *	88X0231-506	CRT Philips MVA48ABK05X
★	9A2862-001	Deflection Yoke
	2A0690-001	Purity & Convergence Ring Assembly
	9A2857-001	Degaussing Coil Assembly
	205X2400-601	Rubber Wedge

## TYPICAL DC VOLTAGES WITH INPUT SIGNAL

Voltages shown below are for reference only

Voltages may vary with input signal and with control adjustment.

TRANSISTOR NUMBER	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q201	Q202	Q203
COLLECTOR	12.0	12.0	12.0	10.7	11.0	11.0	12.0	12.0	12.3	40.6	*	107.8	107.8	107.8
BASE	1.7	1.7	1.7	0.1	0.2	0.2	6.0	12.8	3.3	0.4	0.03	1.7	1.7	1.7
EMITTER	1.0	1.0	1.0	0	0.01	0.01	5.4	12.0	2.6	0	0	1.4	1.4	1.4

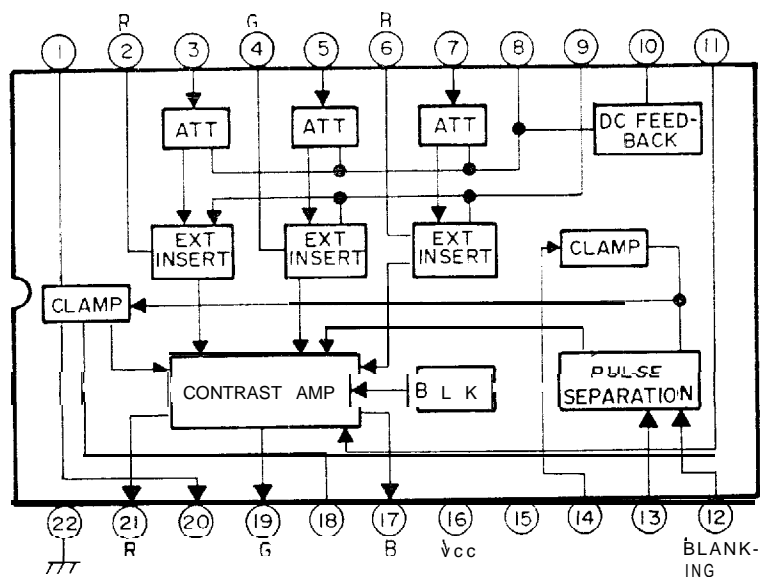
\* DO NOT MEASURE

DIODE NO	ANODE	CATHODE
D1	a.5	31
D2	a.5	9.1
D3	8.5	11.0
D4	a.5	1: 0
35	0.9	10.7
36	0.9	10.7
D7	0.9	10.7
D8	0.55	26
D9	7.7	12.0
D10	12.0	11.4
D11	0	26
D12	0.05	9.8
D13		24.0
D14	0.17	12.2
D15	3	8.0
C16		123
D17	123	
D18	8	*
D19		64.3
D20	0	
D21	0	
D22		164.3
D23		
D24		
D25	24.0	23.6

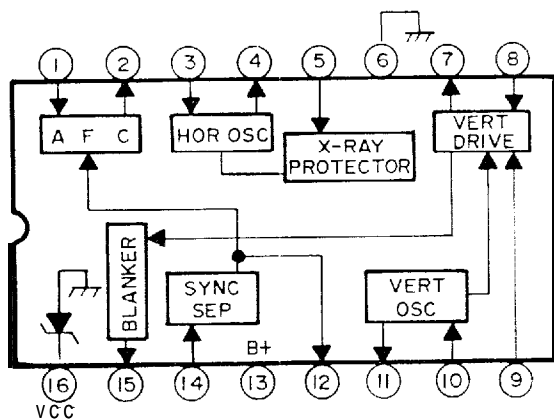
C NO	1	2	3	4
TERMINAL NUMBER				
	3.3	4.3	0	163.5
2	2.0	6.8	12.2	125.2
3	2.7	6.7	23.6	0
4	2.0	0.6	0.8	1230
5	2.7	0.5	0	
6	2.0	0.3	24.0	
7	2.7	0.9	2.2	
8	2.7	3.5		
9	1.3	0.3		
10	10.4	6.2		
11	7.9	0.6		
12	0	1.3		
13	0.55	12.0		
14	2.1	13.7		
15	10.5	0.8		
16	12.0	12.8		
17				
18	3.0			
19	1.7			
20	3.0			
21	1.7			
22	0			

\* DO NOT MEASURE

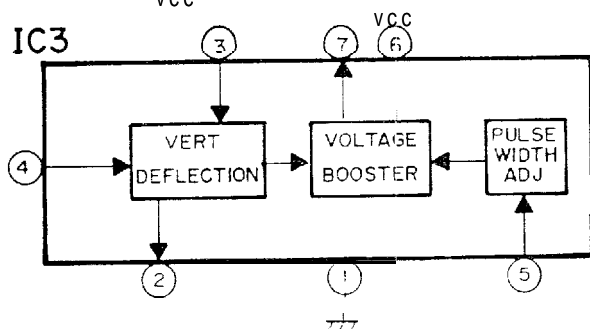
IC1



IC2



IC3



IC4

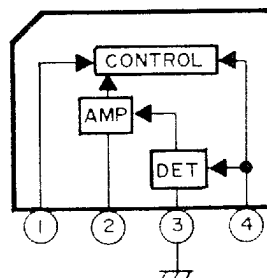


FIG. 11

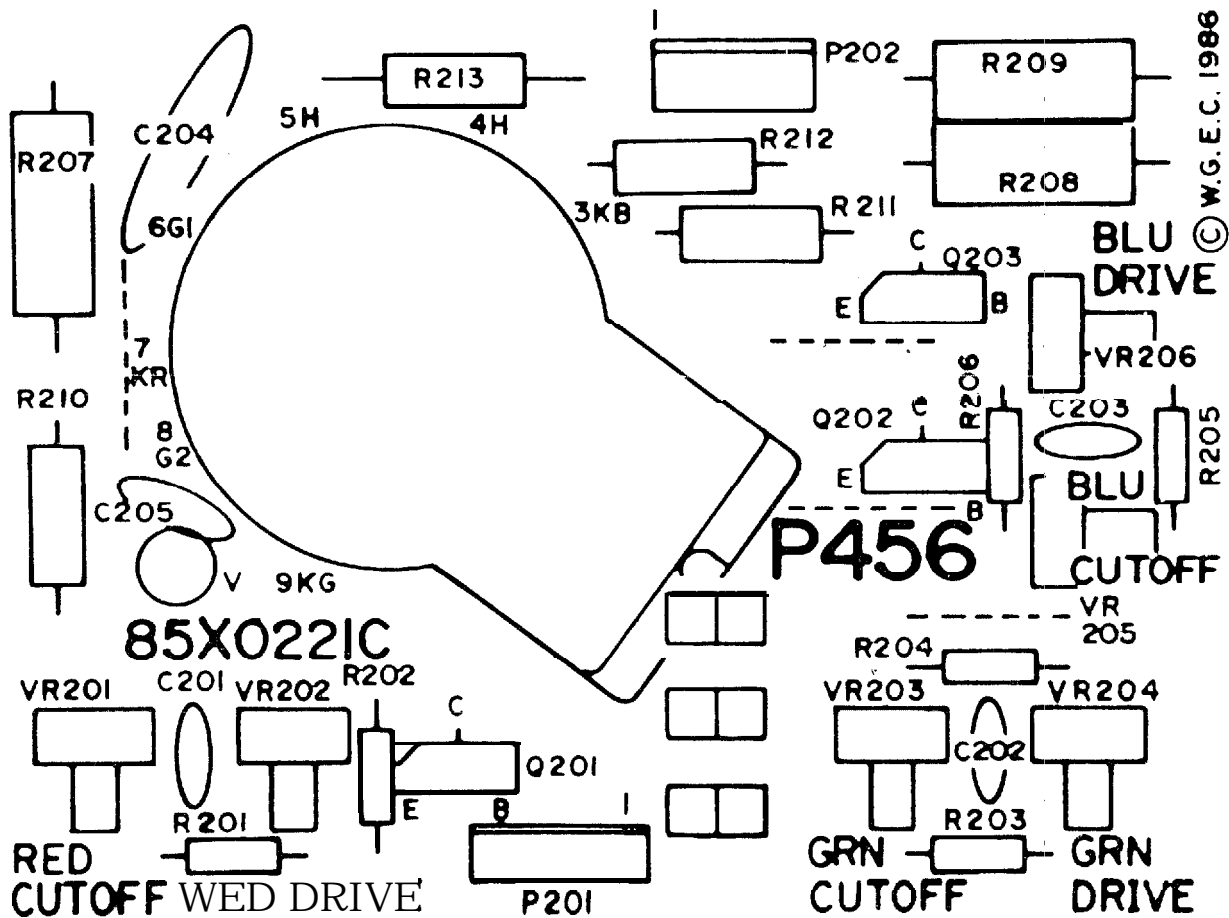


FIG. 12

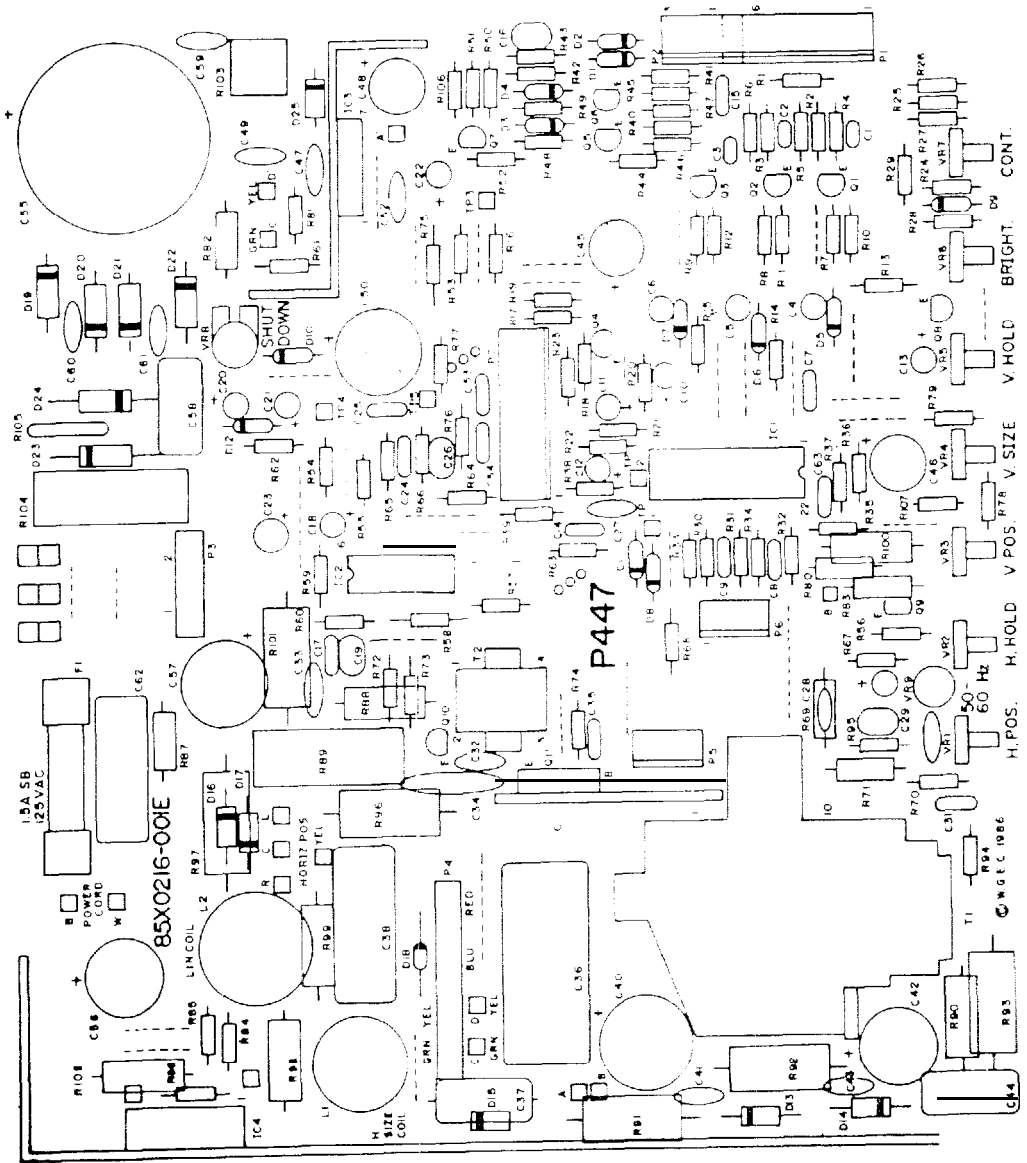
VIEW OF COMPONENT SIDE



FIG. 13



## MAIN PC BOARD LAYOUT



**FIG. 14**

# FRONT CONTROL BOARD P485

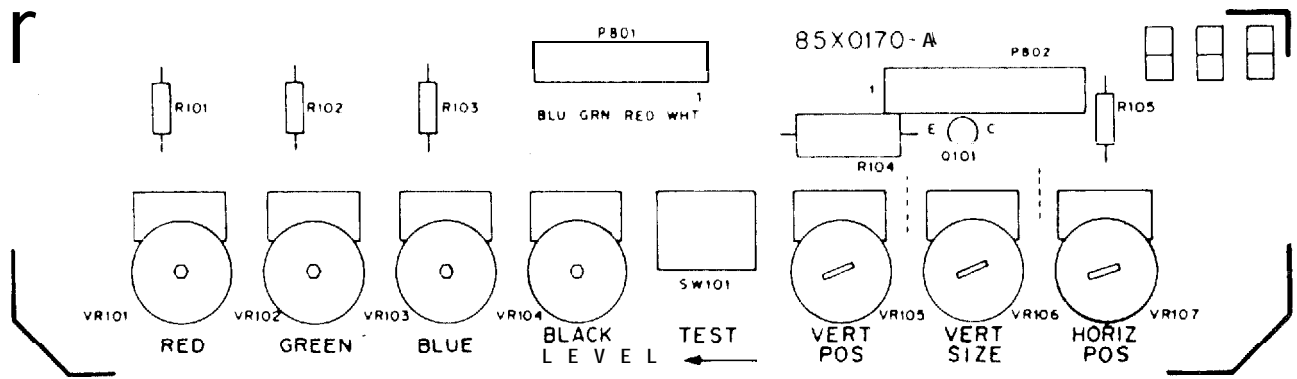
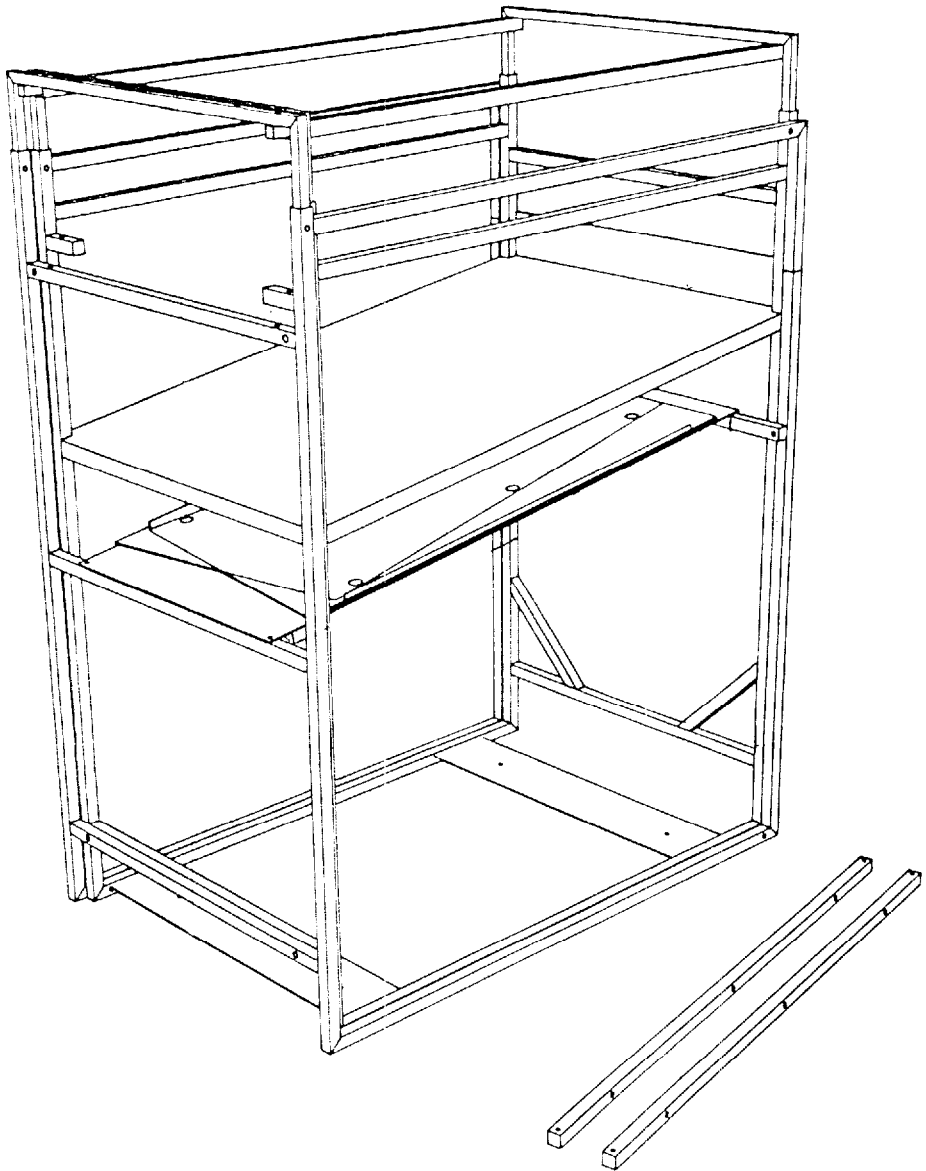


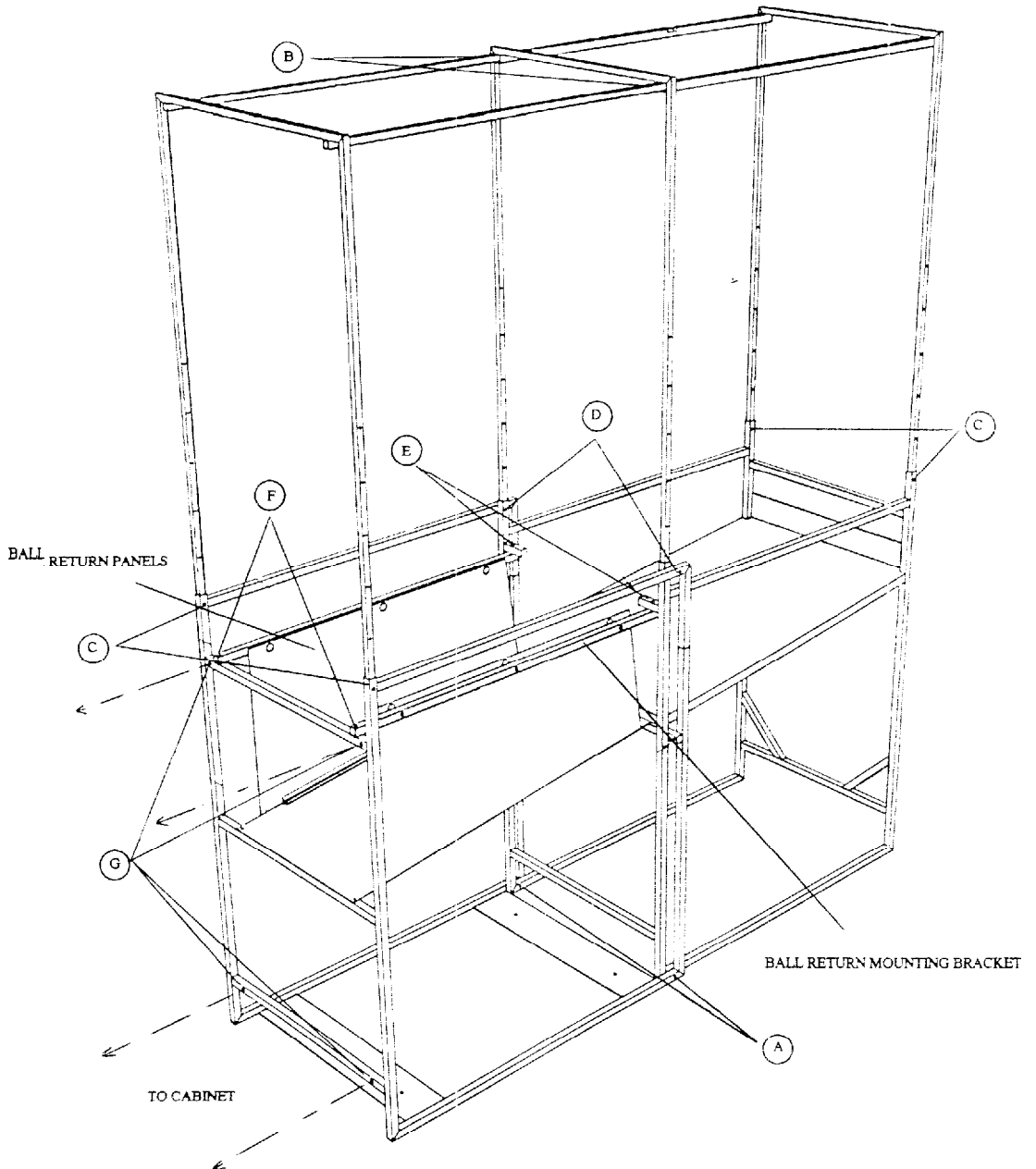
FIG. 15



# COLLAPSED FRAME



# ASSEMBLED FRAME



# NET TO FRAME LACING

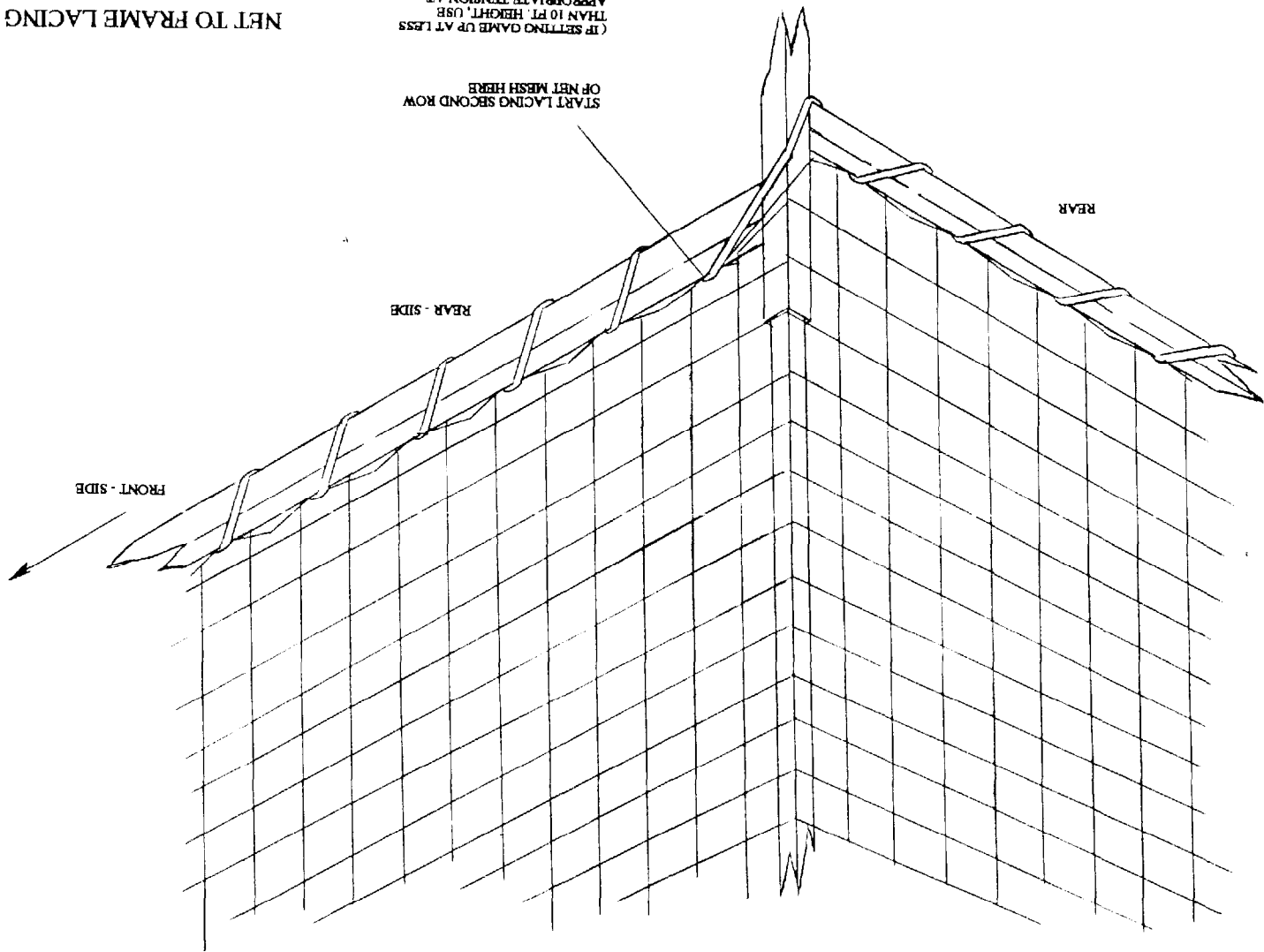
(IF SETTING DAME UP AT LESS  
THAN 10 FT. HEIGHT, USE  
APPROPRIATE TENSION AT  
REAR, AND USE ONE ROW UP  
OF MESH IN THIS AREA.)

START LACING SECOND ROW  
OF NET MESH HERE

REAR - SIDE

REAR

FRONT - SIDE



# CHASSIS, TURNTABLE & BACKBOARD ASSEMBLY

